American Machinist

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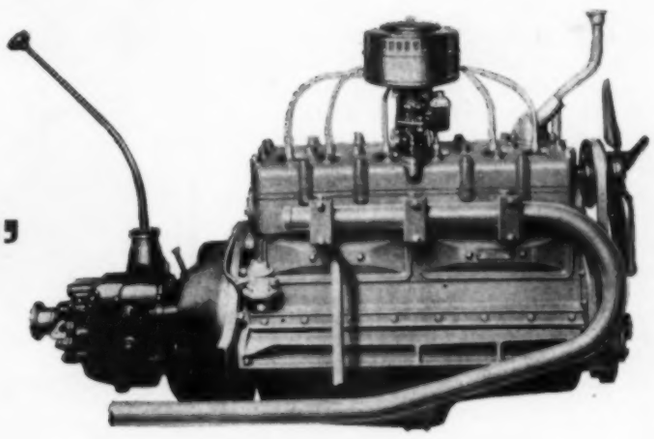
COMBINATION BROACHING on the NASH "400"



FRANK W. CURTIS

Nash's innovation in combining intake and exhaust manifolds with the motor block casting has simplified production as well as design

IN THE series "400" motor now being made by Nash Motors, Kenosha, Wisconsin, the elimination of both intake and exhaust manifolds has led to a modification in the usual practice of machinery cylinder blocks. In place of a separate intake manifold, the cylinder block itself is widened sufficiently to incorporate cored openings to form an integral manifold. The change in design requires a narrow opening which runs almost the entire length of the block at the top face, as shown at *A* in Fig. 1, and four cored holes *B*, which lead from this opening into the intake passages. The cylinder head seals the opening.

Since the carburetor is mounted directly on top of the cylinder head, an additional pad is required, as shown at *A*, Fig. 2. The pad, however, is in the same plane as the bolt bosses and water pad, and is finished at the same time so that no additional machining is required on the head. There is a cored hole through the head, however, leading from the carburetor to the joint face, which is core drilled from the top side to a point where the core flares out.

The method of carrying off the exhaust from the engine is an innovation. Instead of the conventional cast manifold, the exhaust pipe itself fits into three half-circular pads *C* in Fig. 1 and is held in place by three plates. Each pad has a cored exhaust port that opens into the exhaust passage of the block. This construction eliminates the usual milling and drilling operations that are commonly used when machining conventional exhaust manifolds.

The exhaust pipe is made of steel tubing, bent and formed to shape, punched with three holes that correspond with the port openings and provided with a drawn steel cap welded in place at the closed end. The shape of the pipe differs in that the exhaust is carried toward the front of the engine, then down and back under the car to the muffler, primarily as a means of keeping the engine heat away from the front body compartment.

Another innovation on the same side of the block is the addition of an oil manifold. Instead of drilling an oil-well hole the full length of the block,

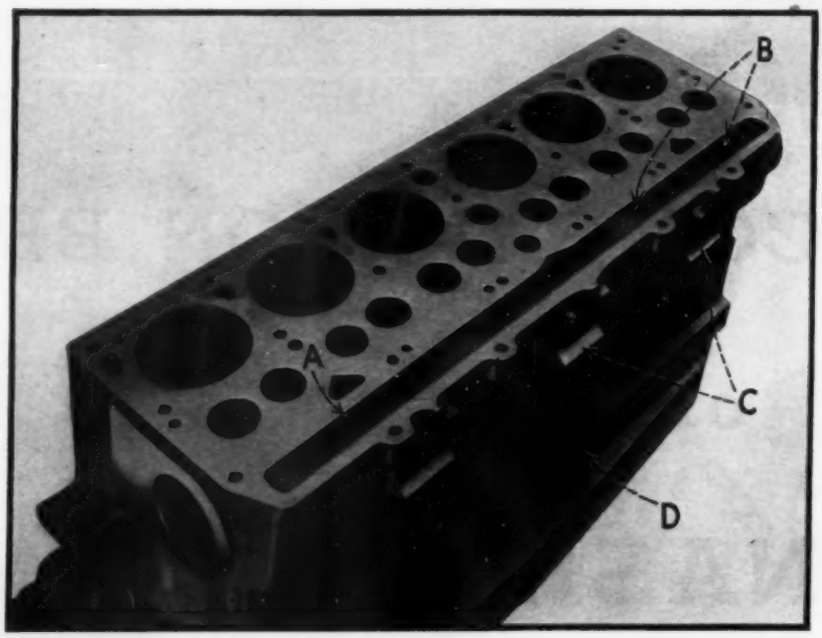
as is so often done, the block is made with a long cored opening surrounded by a narrow pad, as shown at *D*. This pad is finished for a channel-iron cover. Oil enters the chamber under pressure, and then is distributed through a series of drilled holes to the crankshaft and camshaft bearings, as well as to the valve tappet chamber. These holes are drilled at an angle in two separate operations in multiple-spindle drills while the block is on its side.

All Surfaces at Once

These design changes, which are confined to the right-hand side of the block, presented a somewhat different kind of machining problem which has been solved by the use of a hydraulically-operated surface broaching machine. The machine, illustrated in Fig. 3, finishes all surfaces at one pass. At the top of the block are the three circular exhaust pipe surfaces, directly under these are the two valve-cover pads, which have remained the same, a pad for the fuel pump, and towards the bottom the pad for the oil manifold cover. These surfaces are in three different planes.

The block to be broached travels on a roller conveyor, the end of which forms a part of the machine bed, adjacent to the fixture, so that loading and unloading requires no more than pushing the work in or out, as needed. A stationary safety guard on the machine, shown at *A*, prevents the workpiece from striking the teeth of the broach while loading takes place.

The fixture itself is of the tunnel type, extra heavy in construction, and made integral with the machine bed. The block is centered and aligned in the fixture by a hardened steel bar *B*, that fits into the finished bearing-lock surface. A fixed stop provides end location. To clamp a piece in place, a lever at the right of the fixture is engaged first, which causes the base of the fixture to move in about ¾ in. toward the path of the broach in which position it becomes locked. This cross travel can be controlled accurately by means of an adjustable stop that is set as may be needed to position



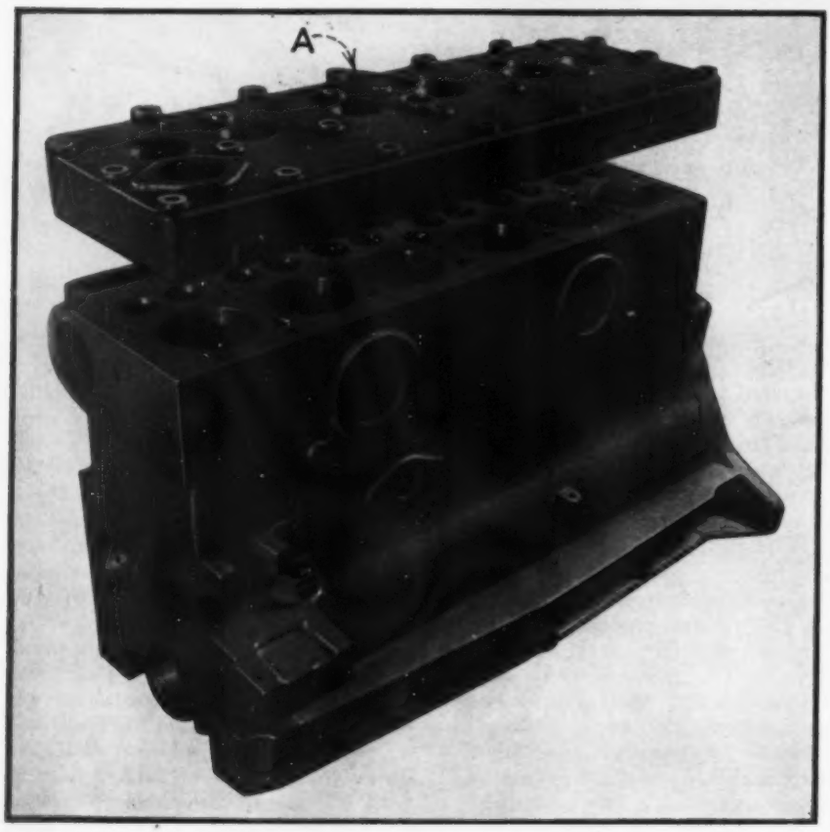


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Fig. 1—Cylinder block casting showing cored intake manifold which is closed by cylinder head. Fig. 2—Left side of block and head showing circular bell plates that replace the conventional full-length rectangular water jacket seal

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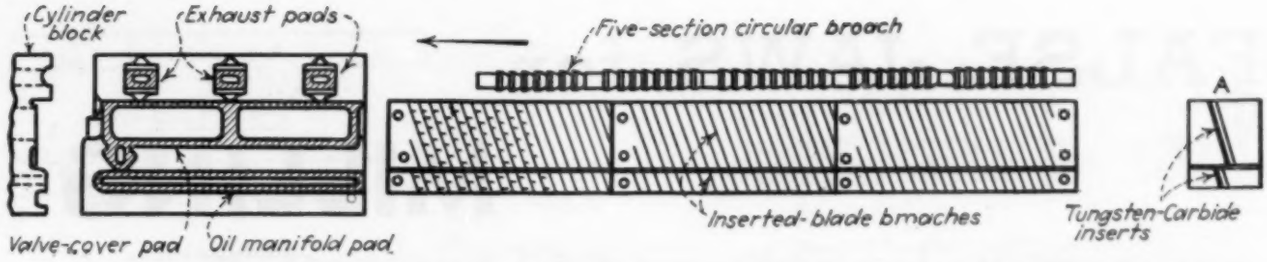


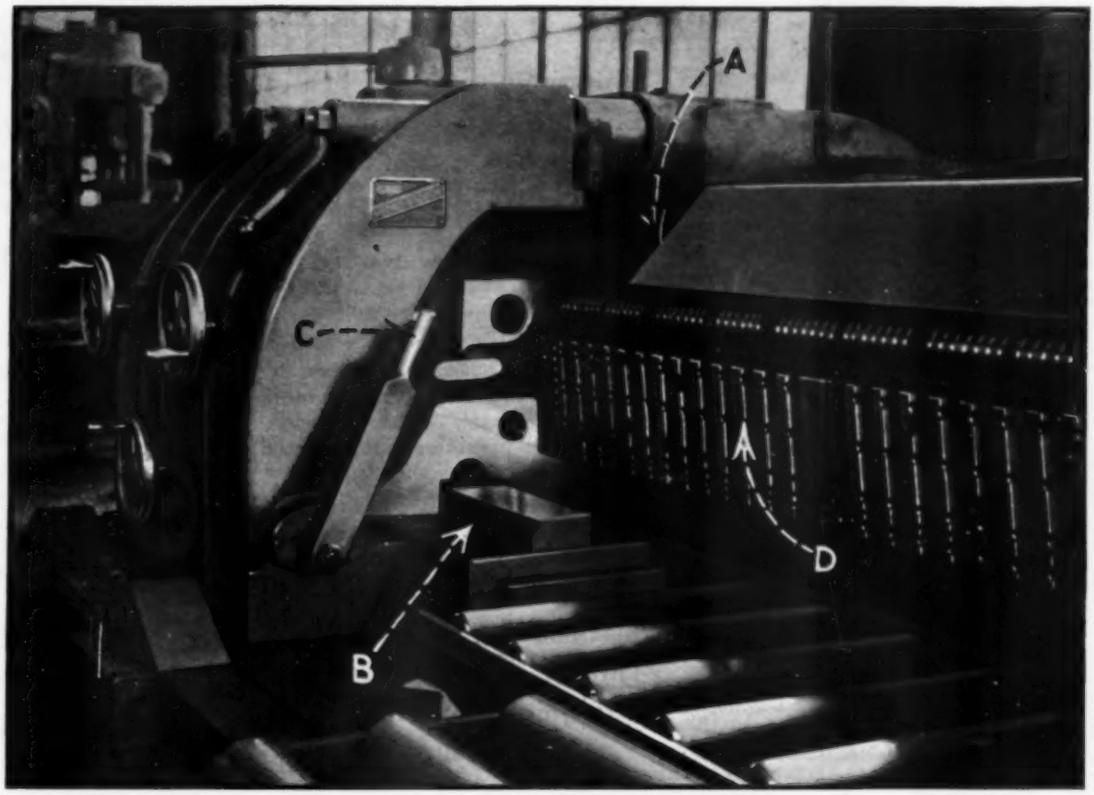


*Fig. 3—Broaching machine with block in position to have three surfaces machined. Fig. 4—*TOP OF PAGE. *Diagram of pads to be broached on right side of block, and broaches including tungsten carbide finishers*

the block for the proper depth of cut when a sharpened broach is installed. The movement also permits the work to be withdrawn from the path of the broach after being finished, thus enabling unloading to take place while the broach slide is being returned to the starting position. Clamping of the block in the fixture is by means of a single lever-operated clamp from the top, and three handwheel-type clamps at the front.

Broach Construction

The broaches are made of high-speed steel, and are of sectional design. At the top of the slide, at *C*, is located a five-section circular broach held in place by caps. See also Fig. 4. Since the three exhaust-pipe pads are semi-cylindrical in shape, the broach can be reset 180 deg. after one-half has become dull, which permits the full 360 deg. of cutting edge to be used. The wide broach section, at *D*, used for the fuel-pump and valve-cover pads, is equipped with inserted blades and is made in three 30-in. sections, each of which is held to the broach slide by holders. The narrow broach, for the oil manifold pad, is also made in three sections and is of design similar to that used for broach *D*.

The two flat broaches are followed by two single-edge tungsten carbide blades, *A*, Fig. 4, about 15-in. from the preceding broach section. These blades remove 0.002 in. of material and act as finishers, assuring smooth surfaces.

A surface cutting speed of 23 to 25 ft. per min. is used. The production obtained is 45 complete blocks per hour. Approximately 2,500 pieces are obtained between broach sharpenings. Two sets of broaches are used alternately for the operation.

Forgings of Aluminum

JOHN E. HYLER

The keen interest that has been developed in lightness of weight for so many products has made all of us more or less aluminum conscious. There are many places where ordinary cast aluminum will serve in an excellent manner. Where much strength is required in addition to lightness, however, the aluminum forging is much superior to the cast product.

Shoes for race horses are one of the recent applications of the aluminum forging, and there are many others. Reducing weight is one thing, while reducing weight and at the same time retaining the necessary strength is quite another. In the latter case, the aluminum forging seems to be one of the most logical choice of a wide range of materials.

FALSE JAWS for MILLING

J. A. POTTER

Machine vises fitted with false jaws are adaptable to a wide variety of parts; here are some practical suggestions

MILLING machine vises fitted with false jaws should be used more extensively than they now are, for they will hold work that is irregular in shape and are much cheaper than fixtures. In making the jaws, due care must be exercised to have them set squarely when they are closed on the work. Generally, the work to be machined should be located by the false jaw that is in contact with the stationary jaw of the vise.

Jaws for holding work that has been drilled and reamed in a previous operation are shown in Fig. 1. The work is located on studs in the false jaw attached to the stationary jaw of the vise. Ordinarily, to place and remove the work from the studs would require the vise screw to be turned several times before the vise will be opened far enough. If, however, a latch or spacing piece, as at *A*, is provided, it can be swung back on its pivot when pressure on the work is released, thus giving room enough to place the work or to take it off the studs.

The latch is mounted on the false jaw attached to the movable jaw of the vise and its thickness should be at least $\frac{1}{32}$ in. more than the exposed length of the studs on which the work is located, so as to give clearance for placing and removing the work. The pin *B* prevents the latch from dropping back too far when it is swung back for placing and removing the work. Pin *C* acts as a stop when the latch is in the operating position.

Work that would ordinarily require a fixture can be held in false jaws by the use of two latches, as shown in Fig. 2. The shank of the work is located on the projecting part of a stud in latch *A*, latch *B* acting as a binder.

Care should be taken not to make false jaws so high from the vise that the work will show chatter marks due to vibration. If the work demands that the jaws shall be high above the vise, an outrigger can be made, as at *A* in Fig. 3. The adjusting screws should be set to rest on the vise without springing the false jaws. Care should also be taken not to make the false jaws so low that the cutter will have to pass through the regular jaws. A good practice is to make the jaws to hold the lowest part of the work to be milled at least $\frac{1}{4}$ in. above the top of the vise.

A cut can, of course, be taken on work that is below the top of the vise, provided the surface to be milled projects from the side of the jaws, as in Fig. 4. If the cut is a plain one, as at *A*, it can be made by an end mill in a horizontal miller. But if the cut is irregular in shape, as at *B*, it will have to be made on a vertical miller, using a formed cutter.

A pair of false jaws having an equalizer for work not quite parallel is shown in Fig. 5. The equalizer is in the false jaw attached to the stationary jaw of the vise. Since the thrust of the cut should be in the direction of the movable jaw, the equalizer will

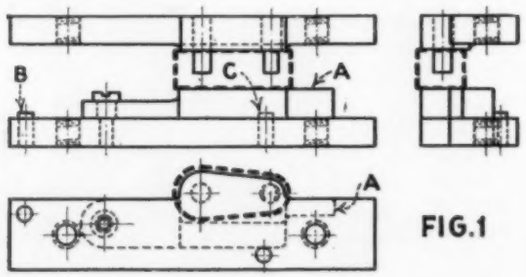


FIG.1

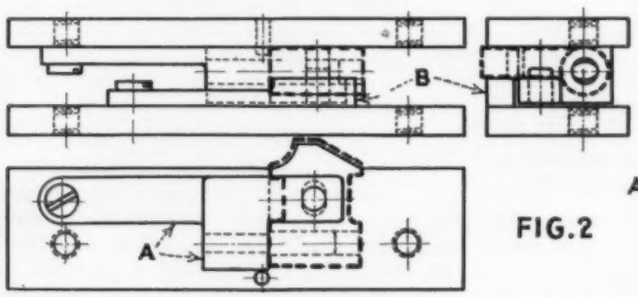


FIG.2

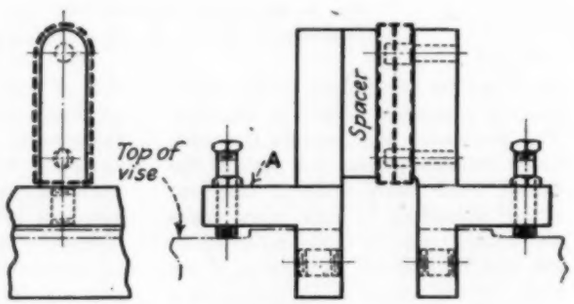


FIG.3

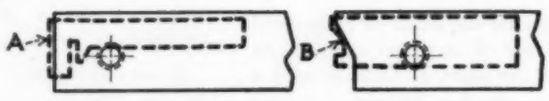


FIG.4

Fig. 1—A latch permits removal of the work from locating stud without wide opening of the jaws. Fig. 2—In this set one latch locates the work while the other clamps it. Fig. 3—Adjustable outriggers support false jaws when they extend above the vise. Fig. 4—The surface to be milled may extend from the side of the jaws instead of the top

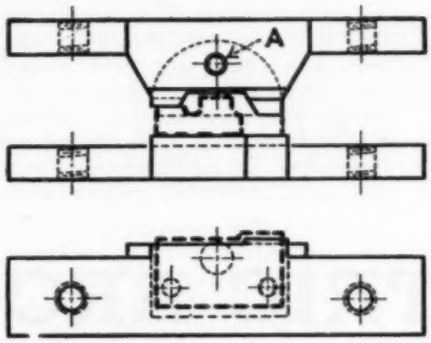
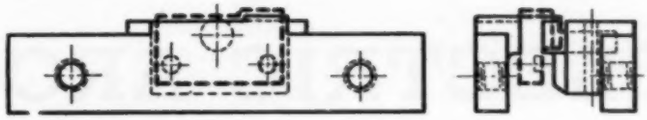


FIG.5



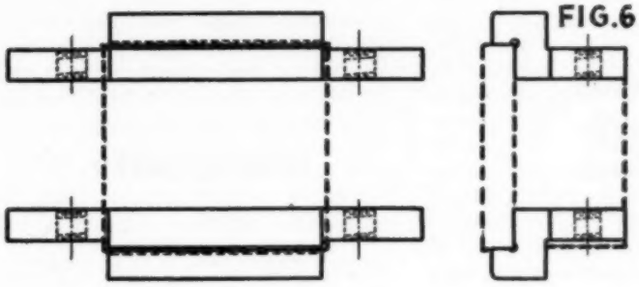


FIG.6

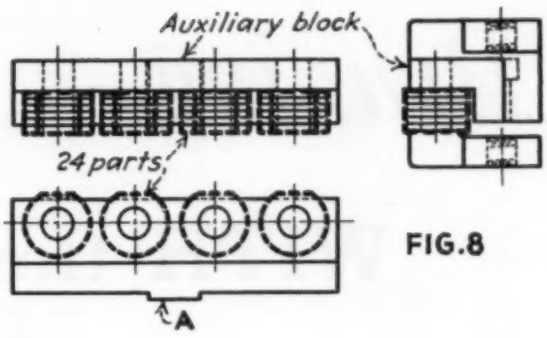


FIG.8

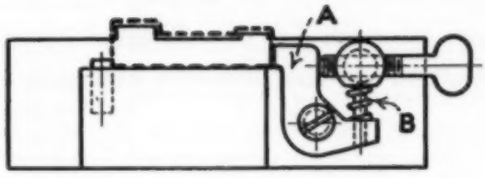


FIG.9

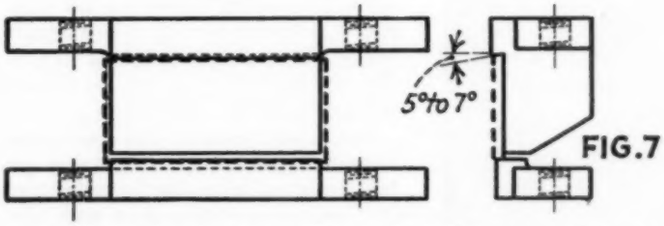


FIG.7

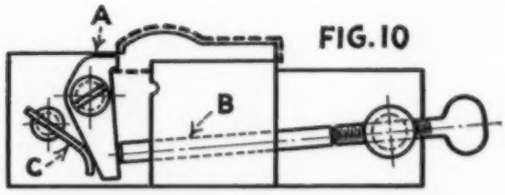


FIG.10

Fig. 5—Work not quite parallel may be held by an equalizing jaw. Fig. 6—Offset jaws will accommodate work wider than the maximum vise opening. Fig. 7—A slight undercut on the jaw nearest the cutter entrance will prevent lifting of the work by the cutter. Fig. 8—Jaws for holding parts in multiple should be provided with a locating tongue. Fig. 9—A ball crank arrangement may be used to clamp the work longitudinally. Fig. 10—Another device for longitudinal clamping uses a pivoted latch

not likely be clogged with chips. The equalizer does not oscillate on pin *A*, the pin being merely to retain it in the false jaw. The hole in the equalizer is enough larger than the pin to permit the equalizer to float sufficiently to take care of irregularities of parallelism in the work. The equalizer bears in its seat, so that the pin is not subject to shear.

Work that is wider than the largest distance the vise can be opened can be held in offset jaws, as shown in Fig. 6. It is not advisable to hold very thin work in jaws of this type, as it is likely to buckle. Thin work clamped edgewise is generally a poor proposition, for the cutter entering the work would be likely to spring it and lift it out of the jaws. However, moderately thin work will not be lifted out of the jaws if the jaw next to the cutter entrance is undercut at an angle of from 5 to 7 deg., as shown in Fig. 7, providing, of course, that the work is not thin enough to buckle.

For Parts in Multiple

Jaws having a removable holding device for parts in multiple can be made as shown in Fig. 8. Two or more of the holding devices should be made, so that work can be loaded in or removed from one while work in one of the others is being milled. The holder should have some means for locating it in the vise, as a tongue at *A*, so that it will be in correct position in relation to the cutter. Should there be any variation in the thickness of the work being held, it would be necessary to provide some sort of equalizer.

Work often has to be clamped longitudinally to take a position relative from some previous cut. Two simple methods that cover such a condition are shown in Figs. 9 and 10. Referring to Fig. 9, the work is held against a stop pin by the bell-crank clamp *A*, which is operated by a thumbscrew passing through a stud. The spring *B* draws the clamp out of contact with the work when the thumbscrew is backed off. In Fig. 10, the work is held by clamping a tongue in its underside against a shoulder by the pivoted clamp *A*, which is operated by the rod *B* through a thumbscrew. The flat spring *C* releases the clamp when the thumbscrew is backed off.

While the examples illustrated are but a few of the false jaws that can be made for holding work of different kinds in various ways, they will serve to give the tool designer an idea how vises equipped with false jaws can be adapted for holding work that would otherwise require special fixtures.

Brazing—

WITH the ELECTRIC ARC

Originally designed for welding cast iron, the coated copper electrode has demonstrated certain advantages in steel and non-ferrous metals, especially for thin sheets

MILES C. SMITH

ALTHOUGH "Brazing With the Electric Arc," is pretty much of a misnomer, it does describe, better perhaps than other words could, a welding process that is fast coming into vogue —a welding process in which the metallic electrode used has a much lower point of fusion than mild steel electrodes and may have, as well, quite a different analysis than that of the metal welded. Bronze, copper, copper with a steel sheath, nickel-copper, and a host of other types of electrodes, furnished either with or without flux shrouds, have recently put in an appearance as being suitable for such use; yet to date there seems to be a scarcity of information regarding the actual value and aplication limits of the development.

Wild But Effective

Several years ago I was introduced to the use of copper as a metallic arc welding electrode. An enterprising welder was fabricating galvanized steel sheet by welding it electrically, using tinned copper wire as the electrode, and, despite the wildness of the electrode deposit, it was easy to see that the procedure as a whole was a step in the right direction. The copper fused down without burning off the spelter to any great extent, and the copper weld deposit was even more resistant to atmospheric corrosion than the galvanized parent metal.

Until recently, however, welding electrode manufacturers either did not realize the possibilities of metallic arc brazing or did not care to disrupt the generally accepted welding procedures. Copper and bronze electrodes were not altogether unknown, but their use was not advocated to any extent. Then there was an about face. Today the welders are confronted with many metallic arc brazing electrodes—so many, in fact, that the fabricator is fully as much at sea in his efforts to make a selection as he was handicapped when none were to be had.

Everyone in any way associated with the process knows that welding as a usable procedure has been handicapped in its development more by over-adoption and unscrupulous claims than by lack of facilities and materials; the same is true for metallic arc brazing. It is a valuable development, and it certainly has a definite place in metal fabricating industries, but it is neither a cure-all nor universally adaptable. This method of joining metals, like every other one, has a definite place and definite limitations.

Amperages used with different sized electrodes on the same parent metal

Electrode Size	Shrouded Mild Steel	Shrouded Copper
inches	amperes	amperes
1/16	22	12
5/64	35	18
3/32	60	38
1/8	100	70
5/32	132	100
3/16	175	138
1/4	220	180

A short arc was held with each electrode. The voltage across the arc ranging from 16 to 18 volts for the smaller sizes to from 26 to 32 volts for the ¼-in. size

This table clearly demonstrates why brazing with the electric arc is applicable for use on sheet steel and cast iron. The welds made on the thinner sections with the smaller electrodes were single pass welds, but the welds made with the ¼ in. and larger electrodes were puddled; that is, the parent metal was chamfered to form a V, and the weld metal was puddled in

Before any mention is made of the suitable applications for metallic arc brazing, let us delve into the metallurgy involved to ascertain how and why these easily fused electrodes function with the more commonly used parent metals. Cast iron, of course, should head the list, since it was largely for arc welding cast iron that the process and the electrodes were developed.

I admit a bias against the use of bronze as a metallic arc welding electrode. Bronzes, particularly the bronzes containing phosphorus to any recognizable extent, can and do poison an electric weld as well as induce brittleness and porosity in the weld deposit. Zinc, tin, lead, phosphorus and sulphur are unwanted elements in an electric weld area and cannot be present to any extent without sponsoring trouble, even weld failure.

A Natural Alloy

Commercially pure copper, on the other hand, readily lends itself to electric application and alloys with practically every ferrous and nonferrous metal in general use. Copper is a most natural alloy of iron and steel, and when fused down, intermingles with them, and particles of the iron or steel

flow through and are included in the mass of molten copper. Chief hindrances to its use in the past have been its wildness in the electric arc and its brittleness when the deposit has cooled. Both of these objections have been overcome in present-day copper welding electrodes.

Perhaps nickel-bearing copper or copper with a steel sheath could accomplish all that we have accomplished with our flux-mantled pure copper electrodes, but we are sure of what we have done and can only speak from our own experience. The electrode that we have been using consists of a core of pure copper and a relatively thin mineral shroud which produces a gas mantle about the weld as it forms and deposits a slag over the weld after it forms; in addition this coating carries an alloying element that combines with the fluid copper to toughen it and increase its tensile strength.

Getting back to the welding of cast iron, cold and electrically, we have had considerable experience and phenomenal success. At first, it was thought that electric arc brazing with the copper electrode was adaptable only for repair work—a maintenance process and nothing more. Now we use and recommend the procedure for fabricating cast iron to steel, cast iron to cast iron, malleable iron to itself or to either steel or cast iron. In fact, it would seem that there is no end of fabricating applications, and so far as we have gone, we have had no failures.

Deposit Absorbs Stresses

As against welding cast iron, either with the oxy-acetylene torch or the electric arc and a steel or cast iron electrode, electric arc brazing has in its favor that the weld deposit is sufficiently ductile to absorb many of the expansion and contraction stresses. The low fusing point of the brazing electrode eliminates excessive heating of the parent metal, so thermal expansion is kept at a minimum, and whatever contraction there may be compresses the copper weld deposit instead of inducing failure in the cast iron.

Welding must be done properly. The copper electrode we use has a range of no more than ten amperes between being applied too hot and too cold, and the electrode metal must be puddled in as it deposits. Use a small electrode, the exact heat or amperage, puddle it in and the weld formed will have a tensile strength far beyond that of the cast iron and be solid throughout.

Here it may be opportune to speak quite generally about welding procedure with a view to assisting some who are having trouble and also remove some of the bugaboo that seems to be current in regard to what may well be termed "specialized welding." Specialized welding of every sort is nothing more than good welding. The welding of alloys, unlike metals, etc., is not difficult providing sufficient preparation and care are used in the operation.

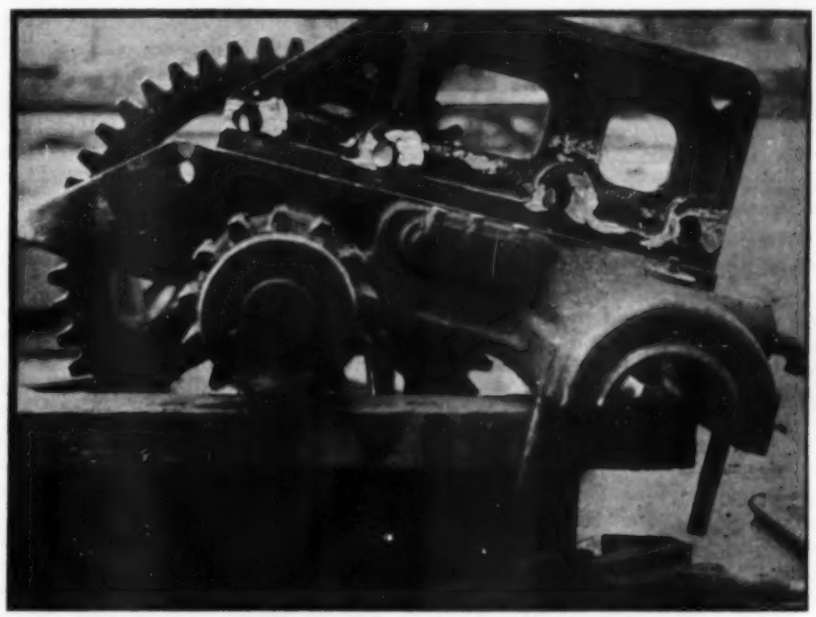
It all goes back again to the basic fact that welding, especially electric arc welding, is nothing more than the pouring of a casting which is expected to interalloy with the parent metal along the lines of contact. Consequently the electrode should melt down at exactly the proper heat to perfect interalloying and be no hotter. Further than that, the arc between the electrode and the parent metal should be as short as it is possible to maintain, when ferrous metals are being welded, and longer with nonferrous metals. If possible puddle the weld metal in with the parent metal and use an electrode that is small enough to permit puddling. Only thin sections can be successfully welded with a continuous unstaggered bead; material that is more than ⅛ in. in thickness can and should be puddled, particularly when brazing with the electric arc.

Cast iron is by no means the only parent metal that has been found adaptable to electric arc brazing The appearance of both a.c. and d.c. welding machines, which maintain an arc at relatively low amperages, has opened up a field for this process that can bring about almost unbelievable economies in sheet steel fabrication. We have successfully welded with as low as four amperes of alternating current, where the arc was stabilized by an auxiliary high-frequency circuit, and the results have been little short of spectacular.

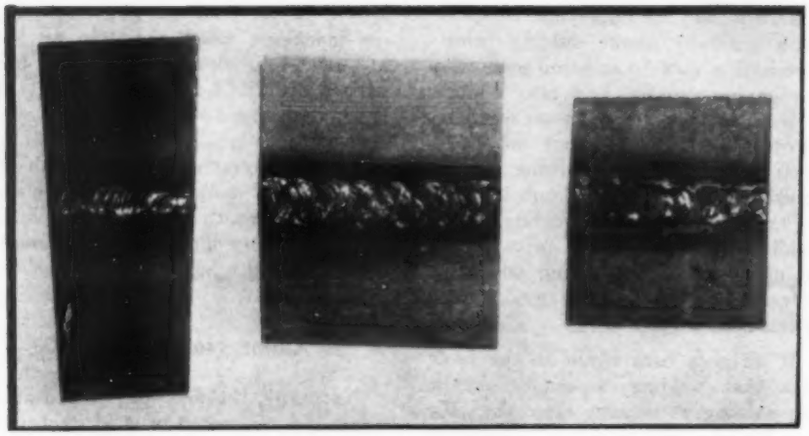
Color Not Uniform

Naturally, the first question to arise when it is suggested to weld steel with something other than steel is what, if anything, is the advantage. Before citing the advantages, and they are many, let us state the disadvantages because they are few. The principal disadvantage is a variance in color.

As to the advantages, first take bare-finished sheet steel of thin gage. This process permits of rapid electric arc welding, either by hand or automatically, with no wrinkling or distortion of the parent sheet, yet the weld will have adequate tensile strength for practically any and every type of thin sheet fabrication. If desired, the welding may be done from the reverse side against a carbon backing, and the weld will need no finishing. Then, more important still in such fabrications, the weld itself will be ductile. Any misalignment can be easily corrected, and the welded assembly can be formed as and where desired.



This cast iron machine part was welded by the Atlas Scraper and Engineering Company, using a copper electrode with a flux mantle



Cut from bare and galvanized sheet steel, these samples were welded with flux-mantled copper using 12 amps. of alternating current. The galvanized sample is at the right

In the case of galvanized sheet, the welding does not disturb the spelter even alongside the weld, and the weld formed is more resistant to the corrosion of atmospheric agencies than the galvanized parent metal. Further than that, the weld, although it does not have the identical same coefficient of thermal expansion as the parent metal, is ductile enough to compensate for any expansion and contraction without fracture; of course, there can be no overheated area in the parent metal adjacent to the weld.

When unlike metals are brazed electrically, or when it is desirable to attach fittings to sheet steel of thin gage, the ductility of the copper weld deposit comes into play again and the weld itself compensates for expansion and contraction.

Electrolysis Prevented

There is another factor to be considered that is often unthought of and neglected. Such fabrications, particularly if they are to be exposed to moisture, are breeders of electrolytic action; again copper assists us out of such pitfalls. The deposit from the copper electrode we use has an electrical conductivity of something like 92 per cent of that of pure electrolytic copper; even though a magnetic pile be produced, the free conductivity of the generated electrical energy will counteract the metallic destruction that might occur were the circuit interrupted.

Still another physical quality of copper adds to its usefulness, particularly in sheet steel fabrications. The alloy in the flux mantle of the electrode counteracts brittleness to some extent, but the fact remains that cast copper is brittle. In the welding of sheet steel, however, the copper weld deposit actually picks up stringers of steel which run through the weld and add to its inherent strength. Then, still more important from the fabricator's viewpoint, is the fact that the more copper is worked, hammered or drawn the tougher and stronger and more ductile it becomes. This physical property makes it possible partially to fabricate and form afterward without any fear of weakening the weld or sponsoring failure. The more the weld is worked or manipulated, the stronger the fabrication.

Welding brass, bronze or copper electrically with the electric arc demands knowledge, preparation and care. The success of the weld depends both upon the analysis of the parent metal and the skill exercised in welding it. Too much zinc, tin, lead, phosphorus or other alloying elements in the parent metal prohibit successful electric welding; in the case of copper, lack of preparation or improper method mean failure. Copper, with its unusually high rate of heat conductivity, will draw the heat away from the weld area so rapidly that a weld cannot form unless the parent metal is either preheated or the section is sufficiently thick to permit of a sort of preheating by the arc itself; that is, unless an arc is struck and then there is a momentary delay while a puddle forms before going ahead with the formation of a bead. For copper welding we use a relatively long arc. With brass and bronze, a medium long arc is recommended.

In the welding of nonferrous metals which have a copper base, the brittleness of cast copper will be found much in evidence, and in order to secure the maximum tensile strength in a weld made with a copper electrode, hammering or otherwise working the weld is essential and recommended.

Cast brass has an approximate tensile strength of 24,000 lb. per sq.in., while phosphor-bronze runs to something like 50,000 and manganese bronze often reaches 60,000 tensile. Cast copper will seldom reach more than 24,000 lb. per sq.in. in tensile strength if it be pure and poured under ideal conditions. In a weld, the cast copper will register even a lower tensile than that, perhaps but little more than 20,000 or so. But when the copper is worked, hammered, rolled or formed, its tensile increases rapidly and often reaches or surpasses 60,000 lb. per sq.in. which is well beyond the 45,000 to 50,000 lb. credited to wrought iron and approaching the 60,000 to 70,000 lb. tensile of cast steel. With the copper electrode, which has the advantage of additional toughening by an alloying element in the flux mantle, a weld, properly formed and properly worked afterward, shows a tensile strength that is little short of the 80,000 or 90,000 lb. required of ordinary well rolled or forged steel.

Counteracting Distortion

Distortion in cylinder blocks, due to studding and to tightening the heads in place, has been discussed many times. Finishing the cylinder bores after the studs are set has helped to avoid some of the distortion that existed formerly. Now, one bright production man bolts a "distortion" head on the cylinder block before the final finishing operations. This head is pulled down just as the regular head will be when the motor is assembled, and the finishing of bores and valve seats is done with the head in place. When this head is replaced by the regular one, the bore and seats should be much nearer perfection than they were with the old methods.

Lighter Hopper Cars

Railroads are waking up to the fact that adding weight to rolling stock is very apt to postpone dividends. One estimate is that 50 per cent of railway operation costs go towards hauling dead weight. Now we have a new alloy steel known as "Prescoloy" that lightens a hopper car by 13,000 lbs. and also permits it to carry 26,000 lbs. more pay load. The makers make this total up to a saving of $220 a year per car. Looks like a step in the right direction.

Cast Iron or Steel

for PRESS FRAMES?

Progress in press building has been so rapid during the past 25 years that careful consideration of developments may be helpful to builders and users alike

SERGIUS D. BROOTZKOOS
Consulting Engineer

THE CONTROVERSY, raging now between adherents of cast iron presses and advocates of steel cast or welded frame presses is based primarily on an outworn conception of cast iron as a material. The name "steel" in the construction of a machine still implies to many people an impression of exceptional strength and ruggedness. Such a conception is excusable for a layman but not for an engineer or a technical man, who should keep himself abreast with latest developments in engineering science and practice.

The cast iron of today is not the material which it was at the beginning of this century with 18,000-20,000 lb. per sq.in. tensile strength; it is an iron-carbon-silicon alloy which can be given tensile strengths to suit requirements for building a wide variety of machines.

The American Foundrymen Association, in conjunction with the American Society for Testing Materials, is advocating the adoption of the following seven standard grades of cast iron (A.S.T.M. Standard A-48-32-T):

Grade No.	Ultimate Tensile Strength (minimum) (lb. per sq.in.)	Modulus Elasticity (average) (lb. per sq.in.)
20	20,000	14,200,000
25	25,000	14,500,000
30	30,000	16,100,000
35	35,000	18,100,000
40	40,000	18,500,000
50	50,000	19,100,000
60	60,000	19,900,000

The selection of a suitable grade of cast iron in conjunction with proper engineering design assures the most desirable strength and ruggedness in the construction of a cast-iron press part as compared to the same piece made of steel.

Progressive press builders and users, who recognize the importance of high-grade cast iron in their presses, are using and specifying a cast iron of not less than No. 35—40 grade, that is, with a tensile strength of 35,000 to 40,000 lb. per sq.in. The steel used in the cast or welded steel frames has usually an average tensile strength of 50,000 to 60,000 lb. per sq.in.

High Compressive Strength

Aside from tensile strength, the cast iron has many qualities of advantage in press construction. For example, the compressive strength of cast iron is the highest of any engineering material, which renders it especially suitable for beds, bolsters, slides, etc. Fatigue characteristics and the damping capacity of cast iron compare favorably with those of steel. These latter qualities of cast iron were lately recognized by the automobile industry which is now using crankshafts and camshafts made of this material with a tensile strength of 60,000 to 70,000 lb. per sq.in. and with a modulus elasticity of 24,000,000 lb. per sq.in.

Cast iron does not exactly follow Hooke's Law, by which deformation (strain) is proportional to load (stress). There is no definite elastic limit for cast iron, but it may sustain static loads up to 80 per cent of its tensile strength. Under higher loads cast iron will simply break. Steel, on the other hand, follows Hooke's Law closely and has a well defined yield point at about 50 per cent of its tensile strength. Higher loads result in permanent deformation of the material.

The lower elasticity of cast iron is a valuable safety feature in case of accidental overload in a press (or squaring shear) especially with the overhanging (C or gap) frame. Under an overload the cast-iron frame would break if the stress upon it were sufficiently high. The steel frame under similar conditions would spring and might remain in its newly acquired shape. If this misalignment of the press frame is not noticed in time, it will cause constant chipping of dies and tools, which often cost more than the press they are used in. It may be concluded, therefore, that the use of cast iron compares favorably with that of steel in the construction of press frames.

Steel More Compact

On account of the difference in the tensile strength, cast-iron press frames are generally built of heavier section than steel press frames. As a result cast-iron frames average about 30-40 per cent heavier than steel press frames. Steel frames are, therefore, used mostly in presses where a combination of strength and compactness of frame construction renders feeding and servicing the machine more convenient as in nailing, bolt heading and upset forging machines, which are in reality automatic horizontal presses.

Steel frames are also used in heavy presses when their weight and shape

is too bulky or too heavy to be machined in the press builder's machine shop or to be transported by rail or steamer.

One argument for steel press frames, sometimes advanced, is that the buyer is at least assured that his press is made of a material with a tensile strength not less than 50,000 lb. per sq.in., whereas the buyer of cast-iron presses has no assurance as to the quality of the material in his machine. To this argument the sole answer is to buy machines from reliable press builders who specialize in building power presses and who enjoy good reputations as to their business and engineering integrity.

Which is the more economical to build, and consequently to sell, steel or cast-iron press? This question is complicated; the cost of constructing any machine depends upon so many factors, as, for example, the cost of raw materials, patterns, equipment, labor, overhead, interest on invested capital, taxes, amortization costs, etc.

For cast-iron and cast-steel presses, manufacturing conditions are to a great extent similar. Economic advantages of building either type can easily be ascertained on the basis of the cost per pound of weight. The weight of a cast steel frame is about 60-70 per cent of the weight of a cast-iron press frame. Therefore, the cost of a cast steel press frame per pound of its weight multiplied by 0.6 or 0.7 must be lower than the cost of the price per pound of the weight of a cast-iron press to be of any advantage economically. For example, a steel frame press at 14 cents per pound is more economical when the cost of a cast-iron press is more than $14 \times 0.6 = 8.4$ cents per pound.

Cast Iron vs. Welded Steel

Economic comparison between the cast-iron and the steel welded frame presses is somewhat more complicated, as the production of welded frame presses requires a smaller capital investment than the production of cast frame presses. On this subject, interesting data were brought out during the symposium, "Welding versus Casting" at the last annual meeting of the American Society of Mechanical Engineers, December 4, 1934.

According to one of the leading speakers* at this symposium, average manufacturing costs of the cast-iron and steel-welded machines in his district were:

Cost of cast iron at the mouth of the cupola	1.2 c. per lb.
Cost of steel plates at the cutting tables	2.0 " " "
Cost of finished cast iron parts	4.5– 6.0 " " "
Cost of finished steel welded parts	7.0–14.0 " " "

Under these conditions, savings in material in the steel welded frames presses would hardly counterbalance the lower cost of the material in the heavier cast-iron presses unless the cost of the patterns for making cast frames were exceptionally high.

The speaker added that for building five or more machines it is more advantageous, in his experience, to make patterns and to construct the machines of cast iron. For building three machines at one time, it is, in some cases, more advantageous to make patterns and to cast the machine of cast iron; in other cases it is of greater advantage to build these machines of welded steel construction. The selection of the method depends upon the cost of the patterns and machining as well as upon the shape of the part. For building less than three machines, especially of a type with a limited market, welded steel construction, as a rule, is the least expensive.

In conclusion a word must be said about semi-steel frames. That designation of metal in press frame construction is a remnant of the past to which the press builders still cling to allay prejudices against cast iron existing among many press users. I am taking the liberty to cite here from the "Symposium on Cast Iron," held by the American Society for Testing Materials and the American Foundrymen Association, at Chicago, June 26, 1933 and published in the A.S.T.M. Proceedings for 1933 (Vol. 33, Part 2, page 118): "*Semi-steel* is a term originally used to designate a cast iron made from a mixture of iron and some steel scrap. While this term is still quite common it should not be used, as it is misleading, the product having none of the characteristics of steel and being strictly a cast iron."

Heavy duty "Fabroil" pinions require the side support of steel shrouds when in service. The operator is shown trepanning some of these shrouds from heavy sheet stock at General Electric's River Works, West Lynn, Mass.

*Sol Einstein, chief engineer, Cincinnati Grinders, Inc.

A level-luffing ship crane mounted on a float and lifting a model U-boat on one hook, a tug on another and a coil of wire on a third

MODELS for DISPLAY

NOW THAT the thoughts of so many men in the machinery industry are turned toward the Cleveland Machine Tool Show it seems appropriate to illustrate the model display room of a German company that exhibits at upwards of a score of expositions in many different countries each year.

Demag of Duisburg, Germany, builds heavy products ranging from hoists, cranes and rolling mills to mining machinery and complete industrial plants. Most of these products are on such a scale that the only way to show them to prospective customers is by scale models. Two views of the model room at Duisburg showing several of the company products are given here.

These models are made in a model shop housed in a small separate building. The shop is well equipped and the men are experts in building this type of mechanism.

Hammerhead crane with a traveler on top and carrying four model locomotives on a platform

ELECTRONICS in BALANCING

J. G. BAKER and F. C. RUSHING
Westinghouse Research Laboratories

REFINEMENTS in machinery with respect to the elimination of both noise and vibration require higher accuracy of balance. With some high-speed rotors the necessary accuracy can be obtained only by balancing at the operating speed, an operation which heretofore has been usually considered impractical.

An unbalanced rigid rotor can be balanced by adding or subtracting weight in two arbitrarily chosen planes perpendicular to the axis of rotation. When the effective unbalance in each of these planes is removed the rotor is both statically and dynamically in balance.

There are a number of machines for determining without calculation the amount and position of unbalance effect in each of the two correction planes. Such machines consist of a combination of some of the following elements: (1) a flexibly restrained carriage, pivoted or effectively pivoted about an axis or point contained in one of the correction planes, in which the rotor to be balanced may be rotated; (2) an arrangement for measuring the amount and phase with respect to rotation of the motion of this carriage; (3) means of introducing a known unbalance effect on the carriage adjustable or variable both in phase or in amount. Machines consist of elements (1) and (2), or (1) and (3).

The element common to all machines—the pivoted carriage—has the function of eliminating the effect, on the vibration of the carriage, of the unbalance component in one of the correction planes. This function is accomplished because one of the balancing planes includes the pivot of the carriage. Thus, any force caused by an unbalance in this plane is directed through the pivot and can, therefore, have no effect on the motion of the carriage because the motion can only be a rotation about the pivot.

The essential difference between the machine illustrated in Fig. 1 and the machines discussed above is that no pivoted carriage is required. The rotor may be mounted in almost any way so long as the unbalance components at both correction planes produce vibration of the rotor or mounting. This feature permits the balancing of rotors in their own bearings or otherwise al-

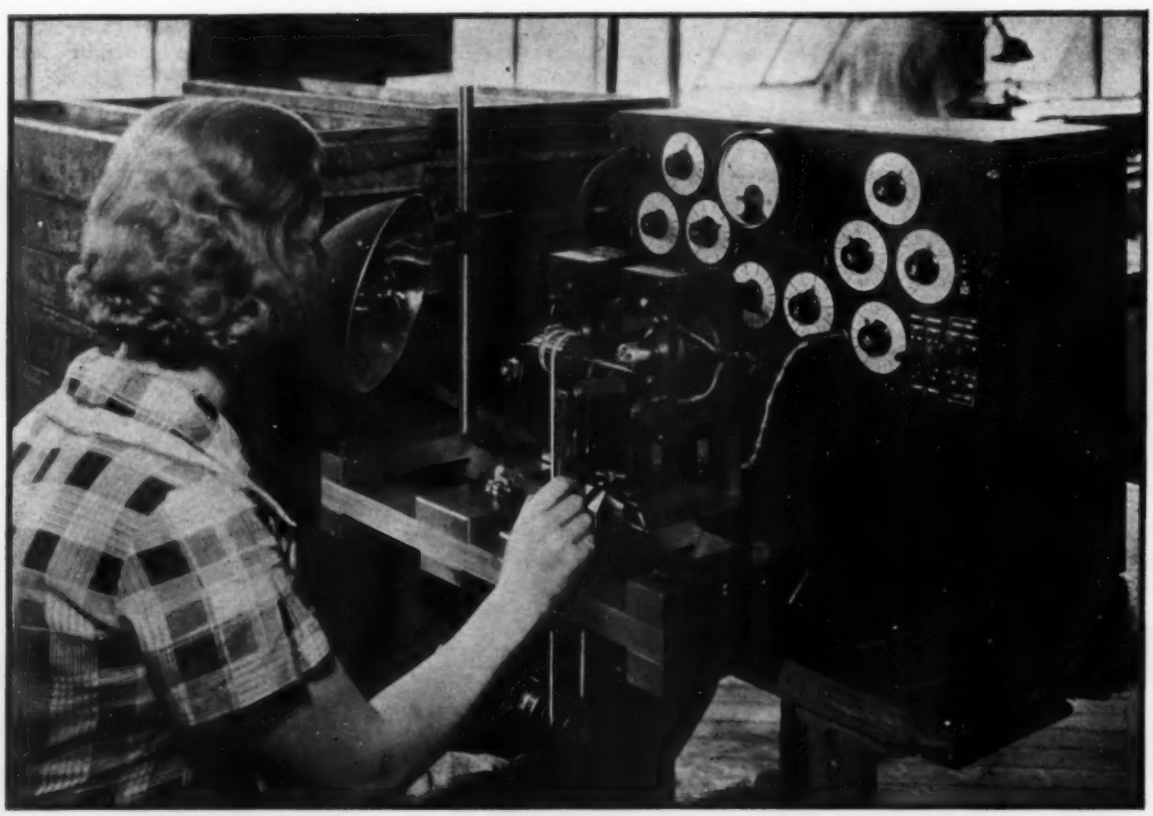


Fig. 1—Amount of unbalance is shown on the large meter at the upper center, and angle of unbalance is read under stroboscopic light from figures wrapped about rotor

Savings as high as 50 per cent have been made by balancing small rotors in a machine that reads directly both angle and amount of unbalance

lows freedom in mounting design not obtained with the pivoted carriage.

Certain high-speed rotors distort nonsymmetrically in coming up to speed, and do so enough to make balancing at the operating speed desirable. But balancing at high speed in a pivoted carriage is difficult for the following reasons: (1) Distortion in the carriage tends to displace the point of actual pivoting from the pivot point intended; (2) the large forces caused by the high-speed rotation of an unbalanced rotor in a pivoted carriage result in severe vibration difficulties. With the machine illustrated the mechanical design may be that which is most suitable for rotation of the unbalanced rotor at the desired high speed with no such problem of pivoted carriage involved.

This machine was developed primarily for balancing problems for which the pivoted carriage is not suitable. There are, however, certain advantages which make the device desirable even for cases in which the pivoted-carriage machine is workable. These are: (1) Mechanical design may be much simpler; (2) Sensitivity of the machine is inherently high because the unbalance is not required to vibrate the mass of a carriage; (3) Readings of unbalance for both correction planes can be made without mechanical changes; (4) Effect of building vibration, even at the frequency of the rotation of the balancing machine, on the rotor's motion may be eliminated.

The pivoted carriage is replaced by a simpler mounting and an electrical circuit or network. The functioning of this arrangement depends on the relation, which exists for almost any mounting, between the balance correction in one plane and the vibration of any two given points of the axis of the revolving rotor.

Vibration at these points is converted into two corresponding voltages by magnetic pick-ups. These voltages are placed on the network in which the same relation obtains between these two voltages and a third voltage, produced by them in the network, as obtains between the vibration at the two given points of the rotor axis and the unbalance correction in one balancing plane. Thus, this third voltage corresponds in both phase and amount to the unbalance effect at one correction plane. Similarly, the third voltage of a second network is a voltage corresponding to the unbalance effect at the other correction plane, the input voltages to this second network being the same as those of the first, namely the pick-up voltages.

Once the unbalance in one correction plane has been changed by the network to a voltage proportional to the unbalance and in fixed phase relation with it the problem becomes simply that of measuring the amount and phase with respect to the rotation of the rotor of this voltage. These measurements can be made in several different ways, of which the following is well suited for quantity balancing of rotors. The amount of voltage is measured with an ordinary a.c. meter calibrated in ounces of unbalance. The phase of the voltage, which corresponds to the position of unbalance correction, is indicated by having it control the flashing of a stroboscopic light. The stroboscopic light is used to illuminate the rotor in that angular position in which the unbalance is opposite a stationary pointer. The angular position of the unbalance is recognized by means of numbers or other identification marks printed on the rotor.

For balancing rotors in their own pedestals in the field these voltage measurements can be made by the use of a conventional a.c. potentiometer, or by the use of a commutator with angularly adjustable brushes on the rotor shaft in combination with a d.c. meter. These methods of measurement require a little more time in operation, but avoid all vacuum tubes.

Figs. 1 and 2 show respectively the general arrangement and a detail of a typical machine. Flexible mounting for the rotor consists simply of two bearings, each mounted for flexibility in a horizontal direction only. This flexibility is obtained by use of two vertical spring steel strips to support each bearing as shown in Fig. 2.

The large B-shaped parts to the left of the rotor in Fig. 2 are two permanent magnets. These magnets, together with the coils which are wound on the cylindrical pieces attached to the bearing supports and extending into the air gaps of the magnets, form the magnetic pick-ups. Thus, the two points along the axis of the rotor at which the vibratory motion is to be measured are chosen at the bearing pedestals. The magnet mountings are similar to those of the bearings. This

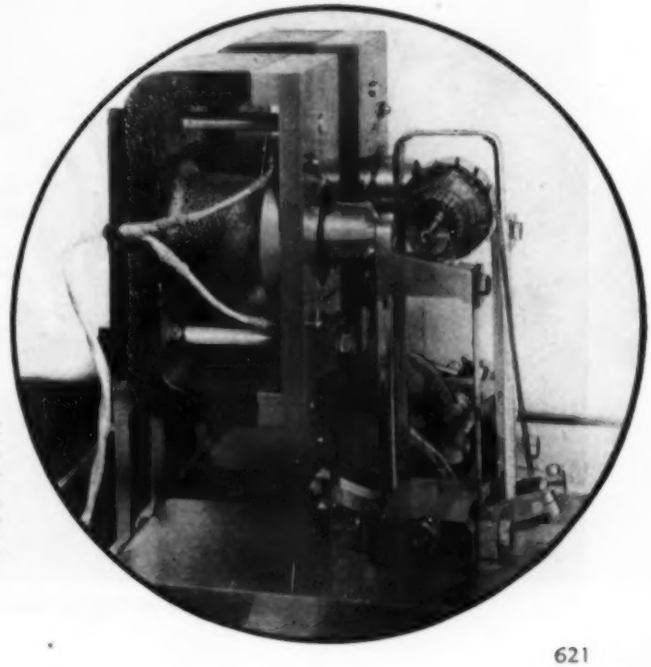


Fig. 2—No pivot carriage is used in this machine. The rotor is flexibly mounted in the horizontal plane by vertical spring steel strips supporting each bearing

combination of mountings eliminates the effect of floor vibration.

The cabinet shown in Fig. 1 contains the network, the necessary power supply and control for the stroboscopic lamp shown in a reflector to the left, a circuit and a meter for measuring amount of unbalance, and switches necessary for convenient operation. There are three of these operation switches, as are shown on the right of the cabinet panel. The double switch on the extreme right is an "end switch" which selects one or the other of the two networks for operation. Thus, with the switch at the "right end" position the indications (meter and stroboscope) apply to the right-end correction plane; with the switch at the "left end" position the indications apply to the left end. The center switch is an "angle-amount switch" which places the output of whichever network is chosen by the "end switch" either into the a.c. meter circuit or into the stroboscopic lamp circuit. The switch to the left of the group is a "sensitivity switch" with which either of two meter scales of different sensitivities can be chosen.

The rotor is rotated by a belt and a motor as shown in Fig. 1. With the machine adjusted for the particular type of rotor the complete unbalance indication is obtained as follows.

1. Press foot pedal to rotate rotor.
2. Place "end switch" at "left end" position.
3. Place "amount-angle switch" at "amount" position and read amount of unbalance at left-end correction plane on meter.
4. Place "amount-angle switch" on "angle" and read the position of unbalance opposite pointer with stroboscopic light.
5. Throw "end switch" to "right end" and repeat amount and angle readings, using appropriate position of the "amount angle switch."
6. Release foot pedal to stop rotor.
7. Press belt lifter lever and remove rotor.

The "sensitivity switch" changes the sensitivity of the meter; for small unbalance this switch is placed in the "small" position and for large unbalance in the "large" position.

The network constants, as set with the middle elevation dials shown in Fig. 1, depend only on the weight distribution of the rotor to be balanced. A given rotor design will always have the same network constants, that is, the same dial settings. With a rotor for which the dial settings for a production type of balancing machine, Fig. 1, are unknown they may be found with the following procedure:

1. Balance the rotor by means of indications made with dial settings for any rotor. This operation requires a longer time than with the correct dial settings in that repeat runs are usually necessary (due to the inaccuracies introduced by incorrect dial settings) after the corrections as indicated are carried out.
2. With the balanced rotor an unbalance is placed in the left end correction plane and the "end switch" placed on "right end" position. With the correct dial settings, and only the correct dial settings, the meter reads zero, since there is no unbalance in the right end. If the meter does not read zero the two network adjusting dials are moved until it does.
3. In a similar way the network for the left end is adjusted. After the network dials are adjusted the dials at highest ele-

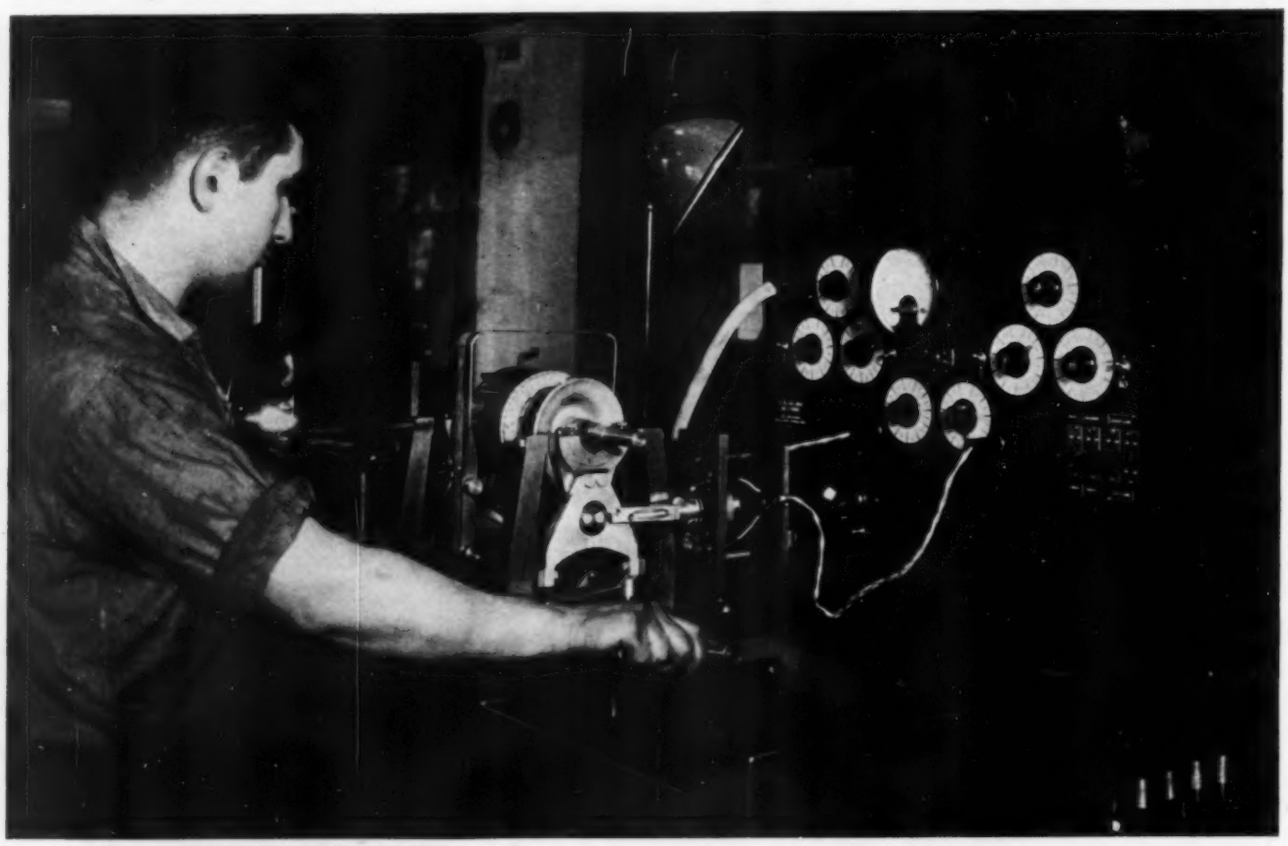


Fig. 3—Another example of bearing mountings developed for small and medium-size rotors

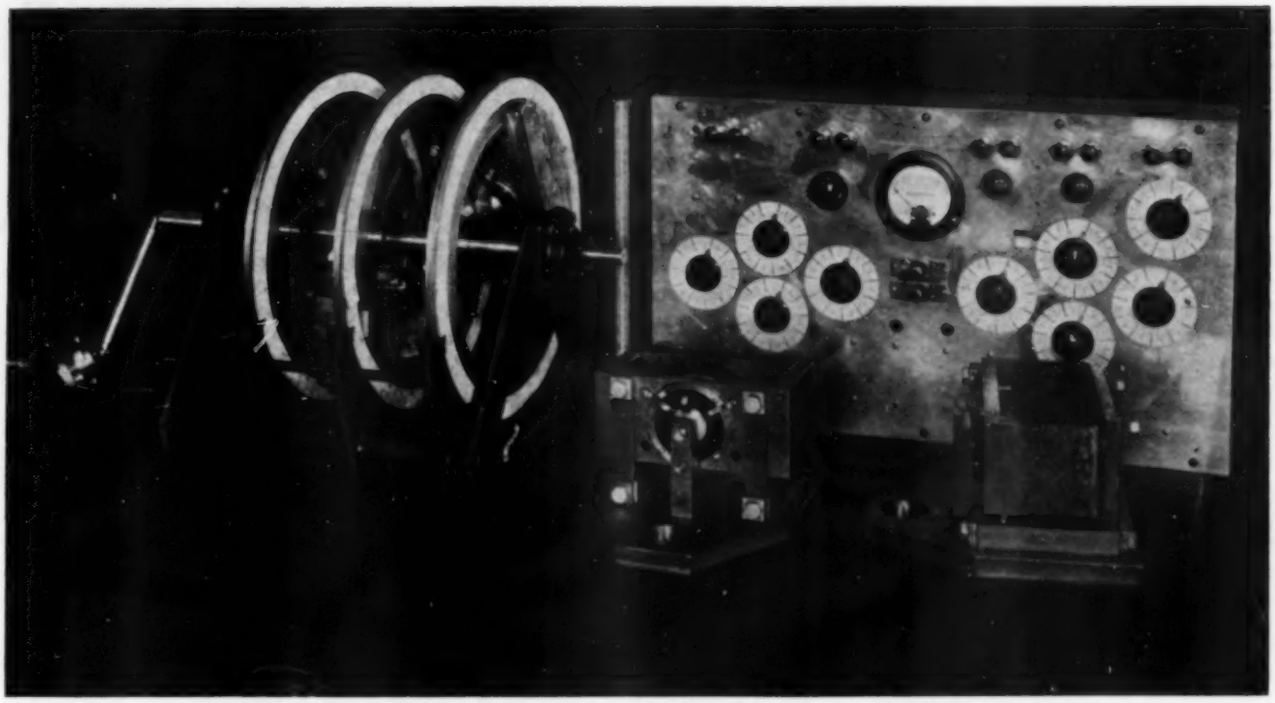


Fig. 4—For very large rotors that are balanced on their own bearings this apparatus is employed. Setting up the machine for individual jobs is not an easy procedure

vation (meter dials) are adjusted to give the correct meter reading for known unbalances in the two balancing planes.

The remaining four dial settings (two dials corresponding to each network) depend on the speed at which the rotor is to be rotated for balancing.

To set the dials for this type of balancing equipment, when applied to the balancing of rotors in their own pedestals in the field, a perfectly balanced rotor is simulated in the network by compensating for the initial voltages in the pick-ups due to the initial unbalance of the rotor.

An unbalance sufficient to cause the bearing pedestals to vibrate at 0.00005 in. amplitude can be indicated. This is of the order of 0.001 oz.-in. unbalance at one correction plane of a 2-in. diameter rotor. The accuracy of unbalance indication for unbalances of the order of 0.05 oz.-in. in a 2-in. diameter rotor is within 3 per cent error.

Features contributing to speed of indications are:

1. No driving motor speed adjustments required.
2. Readings for both unbalance corrections made in a single run without stopping rotor.
3. Adjustments for each rotor are not necessary before taking readings.
4. The readings are direct in convenient units. Curves or calibration charts are not required.
5. Errors of indication have been reduced to the point where a single run is usually all that is required.
6. The machine is not hindered by building or floor vibrations.
7. Changes in set-up from one type of rotor to another can be quickly made, provided the dial settings for the new type are known.

Limitation of machine:

1. The vacuum tubes have to be replaced at intervals of 1,000 hours' service.
2. Balancing at speeds below about 900 r.p.m. is impractical.
3. The determination of dial settings is not as obvious a procedure as that of resetting a pivot-carriage type of machine.

Successful applications of this apparatus have been made for small rotors from 1¼ in. diameter up to 3 in. diameter; medium-sized rotors up to 100 lb. in weight; and for very large rotors, such as turbo-generator rotors. In all cases the speeds of balancing in use are from 1,200 to 1,800 r.p.m. with one exception in which the balancing speeds are from 6,000-8,000 r.p.m.

In the high-speed case the rotor is mounted in bearings similar to its own. In the balancing of very large rotors in their own bearings the apparatus of Fig. 4 is used. For shop production of small and medium-sized rotors the mounting shown in Figs. 1 and 3 are being used.

Broached Piston Pins

The striving for quality in the automotive industry is exemplified in broaching the inside diameter of piston pins recently introduced by Hudson. This removes all drill marks at right angles to the length of the pin and reduces the chance of failure.

Over 250 Hp. on a Single Machine

Power consumption is often cited as a barometer of machine progress. Many of us remember when a 25-hp. engine drove all the machinery in a 50-man shop, and with a lot of power wasted in long lineshafts to boot. Now we use 25-hp. motors on a single machine and never bat an eye. But I saw the daddy of them all the other day in a 100-in. boring mill with a 200-hp. motor on the table and a 50-hp. motor on a boring bar in the center of the ram. And this doesn't count sundry small motors for quick traverse and feeds. A few of these auxiliaries would have run the whole shop in which I learned the trade.

FEDERAL PENSIONS

G. CHAUNCEY PARSONS

THE SOCIAL SECURITY BILL has become the law. As finally approved the bill is essentially the same as when first passed by the House, and provides for the establishment of old age pensions, unemployment insurance, and aid to the indigent, the blind and physically disabled, destitute mothers, dependent children and others hitherto unprovided for save by the several states. It is estimated that the measure, when in full operation, will be of benefit to 30,000,000.

Under the Social Security old age pensions become mandatory, a ruling that affects industry directly since the pension funds will be supported by additional tax levies upon employers as well as employes. All classes of workers, save those exceptions which will be noted later, will come under the provisions of the act, irrespective of salary or wages or type of employment. The title pertaining to pensions, designated as the Federal Old Age Pension Plan, will become effective on January 1, 1937, and benefits will accrue to all employes who have qualified under certain requirements, and who will reach the retirement age, 65 years, on or after January 1, 1942.

What Workers Get

These workers will receive pensions based on the total amount of earnings after the plan has been set in motion and up to the retirement date. The pensioner will receive for the rest of his life a monthly sum, in cash, in proportion to the number of years of employment before reaching the age of retirement, and not in proportion to the worker's needs, condition of health or number of dependents.

Excluded from benefits under the federal plan are domestic servants, casual workers (this classification does not mean temporary employes hired during busy periods), agricultural workers, federal, state and municipal employes, persons employed by churches, charitable organizations, and other strictly non-profit organizations.

It will be noted that white collar workers and executives are included in the federal plan, which means that these higher paid employes, not subject to benefits from some existing private pension plans, will pay into the federal pension fund and will be eligible for benefits therefrom. However, the Act provides that no income will be taxed in excess of $3,000 per year, and accordingly, no employe earning more than this sum as salary can draw a pension based on earnings above that amount. Moreover, all workers now covered by private plans are included, an amendment to except these people having failed of passage.

In order to receive a pension under the federal plan the worker must have reached the age of 65, and must have earned at least $2,000, of which a part must have been earned in the five years immediately preceding retirement. Such items as room, board, clothing, etc., will be credited to the worker's earnings in those cases where these items are figured as part of salary.

How Funds Are Raised

Pensions will be paid from a fund to be created in the Federal treasury, to be known as the "Old Age Reserve Account." Each year's appropriation will be determined according to estimated needs, and will be financed through tax levies on employers and employes. These levies will be based on earnings of the employe, who will be required to contribute to the fund what will be called an income tax; the levy upon the employer will be termed an excise tax. These taxes will have the same rate, beginning with one per cent for the year calendar years 1937-1939, one and one-half per cent for the years 1940-1942, two per cent for 1943-1945, two and one-half per cent for 1946-1948, and three per cent after January 1, 1949.

Pension Ratings

Pensions will be rated as follows: Workers receiving wages totaling less than $3,000 after December 1, 1936, and before reaching 65 years of age, will receive monthly benefits based on one half of one per cent of total earnings. Workers whose total earnings exceed $3,000 will receive (a) one half of one per cent of $3,000, plus (b) one twelfth of one per cent of wages exceeding $3,000 and not exceeding $45,000, plus (c) one twenty-fourth of one per cent of all wages above $45,000.

As fixed by that part of the Social Security Act which deals with old age pensions the pensions begin at $10 per month and reach a maximum of $85 per month. This title also provides that if a worker die before reaching the age of 65, a lump sum payment of three and one-half per cent of total wages paid after December 31, 1936. Workers who continue on the job after reaching the retirement age must continue their contributions but benefits will not begin until employment ends. Moreover, a man's pension will be reduced in proportion to the number of years he continues working. No rights accruing to the employe can be transferred nor can contributions to the fund be attached by law.

Effect on Private Plans

The Act also provides that no credit will be given for any existing private pension plans, whether insured or not. Although Congress will no doubt eventually attempt to amend the legislation toward this end, there is some doubt, in the opinion of this writer, whether such an amendment will be practicable.

Private pension plans now in operation cover about 4,000,000 workers, of which approximately 2,000,000 are employed by the railroads. Senator Clark, who fought for inclusion in the bill of the Amendment bearing his name and which provided for the continuance of existing private plans under government supervision, has pointed out that those workers now contributing to private plans would, in the event this law is declared unconstitutional, need some provision to protect them against loss of pension contributions.

The truth of the senator's statement is readily apparent, since the denial of the right of employers to continue operation of private pension plans in lieu of the federal plan will doubtless result in the liquidation of some existing private pension systems. It is probable that workers will receive credit for contributions paid in in these instances, but this will not be sufficient. Private pension plans now in operation should be continued along with the Federal plan, as it is obvious that even the maximum pension under the latter is inadequate.

This can be seen by estimating the total years of employment and salary necessary for the pensioner to receive a monthly pension of $85. As set forth in that section of the act by which pension amounts are computed, the employe must earn $129,000 before reaching the retirement age before being eligible for retirement at the maximum figure, and since his salary is not taxed in excess of $3,000 per year, he must work at this figure for 43 years.

EDITORIALS

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K. H. CONDIT • F. H. COLVIN
EDITORS

The SHOW . . .

and the FUTURE

In bygone days it was a byword that all roads led to Rome. Today, in the metal-working industry, it is equally true to say that all roads lead to Cleveland and the Machine Tool Show.

For months the designers and builders have bent every effort to develop tools that will make a visit to their respective booths worth a long journey. How well they have succeeded will be evident enough to those who go to Cleveland. We can vouch for their success because we have seen many of these products in the development stage, and have received descriptions of most of them for our Machine Tool Show Number.

Those who go to the Show as buyers will have an unparalleled opportunity to compare the design and the performance of the various competing units of the types in which they are interested. Those who go to observe the advances in the art will see evidences of progress that will amaze them. Those who go partly to see the Show but more to see the men who will be there will find the great majority of the leaders of the metal-working industry, for this Show promises to bring together more such men than have ever assembled anywhere.

After months of what we hope has been mainly constructive criticism of the federal administration and its moves against business, it is a blessed relief to forget the exasperations of the present and dwell for a moment on the promise of the future. For we see in this exhibition clear proof of the indomitable spirit of progress that animates the machine tool industry. We hold that no country capable of producing such an industry can have anything but a fair future. And we are sure that an industry that can come through a major depression as this one has done, and can build for the future as this one is doing, is insuring its own future beyond question.

You are cordially invited to visit us at Booth A-7

Comfort & Efficiency

COMFORT in the shop has much to do with efficiency. No modern manager tries to save money by skimping on adequate heat for his men in winter. Even if he were tempted to do so the requirements of his hydraulically controlled machines would make it unwise.

Comfort in summer is just as essential as in winter. But air conditioning is a newer and, seemingly at least, a more difficult problem. So far we have confined it mostly to the office, but it will probably pay even bigger dividends in the shop. Mr. Ford seems to think so, at any rate.

With shop temperatures and humidity far above the comfort line, plant efficiency suffers in more ways than one. Men are likely to be irritable, and less accurate, as well as less active. Executives are tempted to spend as little time as possible in the shop and more in their air-conditioned offices.

Air conditioning of plants is not a simple problem, especially in departments where heating processes are involved. But equally difficult problems have been met and solved in the past. Here is a field that deserves careful attention, especially where new plants are being erected, or even considered.

Comfort and efficiency go hand in hand.

[*The editor who wrote this is just back from a ten-day trip to the hottest part of the Middle West.*]

Chips

Washington—Roosevelt signs the Social Security Act amid considerable stage setting . . . House votes potato into AAA as Bori has her "potato" cut out . . . Passes Guffey Bill as ordered . . . Senate orders investigation of results of silver purchasing program, here and abroad . . . Congress is urged to adopt neutrality policy now before hostilities are declared anywhere . . . Nye announces filibuster on all administration bills until neutrality bill is passed . . . Tired Senate passes it . . . Omnibus Banking Bill conference report accepted by Congress . . . Revised railway pension bill passed, also new Frazier-Lemke bill . . . The tax bill without the inheritance levy is settled in conference and passed . . . TVA measure also gets through conference and is passed . . . Roosevelt gets behind youth relief work in message to State directors . . . Fifty lawyers will study New Deal legislation for constitutionality and reports will be published by Liberty League . . . Six more agencies go under Bureau of Budget . . . Railroad Reorganization Bill goes to White House.

Foreign—Assassination of high Japanese army officer held likely to hasten cleaning up of military political mess . . . Germany army chief orders use of old-fashioned, almost unintelligible Gothic letters in printed notices on ground that they are more patriotic . . . Boycott of German language classes in schools in other countries not impossible result . . . Britain suggests fall conference on naval limitations . . . Discovers that searchlight anti-aircraft defenses are hopelessly inadequate . . . Mussolini's determination to provoke war at any cost worries European capitals . . . Schacht pays his respects in sarcastic terms to Nazis who break windows under cover of darkness . . . Speech threatens to bring showdown . . . Dimitroff, Bulgarian Communist figure in Reichstag fire trial, is made head of Communist International . . . British cabinet meets to study impending European crisis . . . U. S. protests to the Soviet over Communistic activities here.

Finance—Treasury makes record purchase of 25,000,000 ounces of silver . . . New dollar bills to appear soon, fractional currency plan tabled . . . Senate votes open silver market amendment to tax bill, also one to stop issuance of tax-exempt federal securities . . . John D. Rockefeller, Jr., heads list of millionaires who give away large sums as result of Roosevelt tax program . . . J. A. Moffett says silver purchase policy has not hurt China after all . . . Possibly he had the Japanese menace in mind as a basis of comparison . . . Atchison and A. T. & T. declare usual dividends on 9 per cent basis.

Industry—R.F.C. considers steps to finance light weight streamlined trains . . . Westinghouse Electric raises wages of 20,000 men by 5 per cent . . . Presidential intervention in New York ship strike is looked for by both parties . . . Federal court in Denver upholds right of federal government to make loans to municipalities for building publicly-owned power plants . . . New Jersey WPA director of training offers to pay relief wage to men put in training in industrial plants . . . This being the first sensible suggestion that has come from WPA it is promptly declared illegal by Washington.

Trade—German exports rise 12 per cent as export subsidy fund begins to function.

Indicators—Steel continues its surprising rise past the 50 per cent mark . . . Electric power output off but nearly 10 per cent ahead of 1934 . . . Business Week's index rises half a point to 66.9.

Congress Buys Release From Capitol By Bowing to President's Demands

WASHINGTON—The seventy-fourth Congress is dead. Few industrialists will mourn its demise; many hope they will never again see one so subservient to an administration or so antipathetic to business.

Thoroughly fed up with their prolonged stay in Washington, senators and representatives turned to the "must" bills and passed them, giving in to at least 90 per cent of the Chief Executive's demands. Whenever opposition to one of these bills arose the hand of the administration "lobby" appeared to convert the wayward. Never, even in war time, has the executive branch of the government so dominated the legislative.

Having greatest direct influence on the metal-working industry are the Social Security Act and the tax legislation. The Security Act is regarded as the meager beginning of a great permanent program; it is the most decided step ever taken in this country away from individualism and initiative. In effect it gives everyone the right to depend upon the government for a "living." In it, its sponsors see a Magna Charta for the aged, the unemployed and the unprivileged. They admit that it marks a departure from pioneer philosophy but argue that the step should have been taken when the frontier disappeared.

An abundance of immediate work is at hand for the Social Security Board —John G. Winant, Arthur J. Altmeyer and Vincent M. Miles. They are being urged to go to London at once so as to familiarize themselves at first hand with British experience. It is possible that such a trip may be made before any attempt is made to write administrative regulations.

While the tax collector does not begin to pass around for his three per cent of payrolls until next February, money was appropriated for disbursement among the states for old-age relief. Before these allocations can be made regulations must be prepared and studies made of laws in the 30 states that have old-age pension laws.

Nothing in the new revenue act will have important immediate effect on business but it contains many precedents that arouse apprehension. It takes less money out of the pockets of industry than had been anticipated. Curiously enough the act hits smaller corporations hardest—those with wide variations in profit and loss. Excess profits taxes lost most of their sting when 1934 declarations of value were eliminated.

While not directly influencing the metal-working industry the Guffey Coal Act and the utility legislation establish important precedents if their constitutionality is upheld. The former establishes over a single industry all the employer-employee regulation found unconstitutional in the old NRA. The law, admittedly inequitable in many respects, was passed with the idea of testing government control of labor relations in an industry whose operations undeniably affect interstate commerce.

The Utilities Act drastically restricts and supervises corporate set-up and distribution of earnings in this industry. If these two laws remain on the statute books they will undoubtedly be used as patterns for further legislation to subordinate business to the Federal government.

Joseph W. Madden, Pittsburgh law professor, John M. Carmody, former editor of *Factory Management and Maintenance*, and Edwin S. Smith, labor specialist, presidential appointees to the National Labor Board, were confirmed by the Senate.

Table I—Index of Orders Based on Volume of Shipments for 1926

Month	Index of Orders: Domestic	Foreign	Total	3 Months' Average Index	% Foreign to Total Orders
1935—January	52.0	13.5	65.5	61.3	20
February	41.2	10.9	53.0	61.5	20
March	48.5	13.8	62.3	60.3	21
April	54.5	11.2	65.6	60.3	17
May	57.3	16.0	73.3	67.1	21
June	75.5	15.6	91.1	76.7	17
July	82.5	37.3	119.8	94.7	31

Table II—Index of Orders—By Size of Companies

Group A—Companies reporting year's sales in 1926 of $200,000 or more:

Month	Index of Orders: Domestic	Foreign	Total	No. of Reports	% Foreign to Total Orders
1935—January	51.6	14.3	65.9	91	22
February	42.1	11.4	53.5	98	21
March	48.0	14.4	62.4	94	23
April	54.8	11.8	66.6	94	18
May	57.3	16.7	74.0	83	23
June	76.0	16.0	92.0	88	17
July	87.0	80.3	38.8	119.1	33
Group B—Companies reporting year's sales in 1926 of less than $200,000:					
1935—January	57.1	1.9	59.0	78	3
February	42.1	4.5	46.6	81	10
March	55.7	5.5	61.2	78	9
April	48.0	3.8	51.8	75	7
May	57.3	3.2	60.5	55	5
June	68.1	10.9	79.0	69	14
July	117.6	13.8	131.4	62	10

Table III—Distribution of Orders

(Shown by indexes of individual companies)

New Orders in % of 1926 Shipments	Number of Reports in Each Index Group: Jan.	Feb.	Mar.	April	May	June	July
200 or more	10	6	6	7	6	14	31
100–199	21	19	25	21	21	31	35
90–99	5	5	8	3	8	8	5
80–89	10	3	5	9	3	8	7
70–79	8	10	9	13	11	10	8
60–69	10	8	7	13	6	10	8
50–59	10	18	15	13	8	5	14
40–49	13	18	21	16	9	7	9
30–39	12	21	21	14	11	15	7
20–29	21	23	13	17	15	15	9
10–19	22	18	23	18	11	14	6
Less than 10	27	30	19	25	29	20	10
Total Reports	169	179	172	169	138	157	149

Seven Months' Tool Sales Surpass 1930 Average

In a new burst of volume, July sales, as reported by the National Machine Tool Builders' Association, reached a level which has not been achieved since the crash of 1929. In June the 15-year average index of 76.2 was exceeded by 20 per cent, but July topped the June figure by over 31 per cent. In addition, it brought the average volume for the seven months of 1935 well above the 1930 average of 70.9.

The 31 per cent of foreign sales recorded was an abnormally high portion of the total and did much to contribute in pushing the July index up to 119.8. However, a counter seasonal improvement in domestic sales is shown by an increase in this classification of 9 per cent over June.

Shipments are far behind the new orders received, and unfilled orders are mounting rapidly. At present, estimates of unfilled orders aggregate about twice the current rate of shipment.

Detroit Optimistic As Work On New Models Advances

DETROIT—Considered from most angles, the automobile industry, including supplier services of all sorts, is in a favorable situation. Although several plants are just about cleaned up on 1935 production, sales are still being made at a high level. Based on available returns, July sales are anticipated to be close to 350,000 including trucks, which is somewhat better than June, and checks with many suppliers' observations that July was about equal to June.

One angle, not so favorable in the returns to date, is the reduction in the independents' portion of the market despite recent favorable reports of a few such producers. The pronounced trend in styling during the past three years has increased yearly die costs tremendously, and unless a rate of production sufficient to utilize most of the productive life of these dies is obtained, a disproportionate amortization charge against each car sold eats into profits or consumes them.

To offset this handicap, some independents are arranging for common use of body panels, excepting fronts and rears where individuality may be given to the product. This healthy development insures some of the advantages long enjoyed by integrated corporations. The principle would seem capable of expansion into parts of the car other than bodies. Certain it is that the industry and the car buying public needs the independents.

The announcement in its quarterly statement to stock holders that General Motors will spend $50,000,000 in improvement of manufacturing facilities and plant expansion is easily the outstanding development of the month. As usually happens in connection with such announcements, much of the money has already been spent or contracts let and is largely responsible for the favorable upturn in equipment sales previously reported in this column. Expansion in building space is provided for the Electromotive Corporation, The Allison Engineering Corporation, The Pontiac Fisher body plant, the plants in Saginaw and the Durant plant for the manufacture of Olds bodies. Extensive development of warehouse facilities for parts merchandising also is a part of the program. Replacement of items considered standard machine tools is included in the program. In the Buick program, announced as totalling $14,500,000, expansion for parts manufacture, especially transmissions, for other units in the corporation is provided.

Production of bodies for Olds at the Durant plant is expected to begin in September. These expansion moves tend to eliminate the body as delay factor, such as it was last year, and at the same time increase capacity of the corporation some 400,000 cars. With General Motors past its first million cars in 1935 and the Ford Co. expected to reach this figure between September 1 and 15, good times are ahead of the industry.

Seventy-nine Spindles—**Typical of the automotive industry's busy summer is this five-way tapping operation on a Ford V-8 engine block. Orders pour in despite the prospect of new models soon**

Tools for U. S. S. R.

It is reliably reported that a complete tool and die program for the manufacture of a car in Russia is now on the boards and will be on the shop floors by the first of September. This will prolong the work available for this industry and serve as a fill in for many 1936 programs nearing completion.

Small tools are picking up, and tool and die shops are running more than one shift as are plants building special equipment. Considerable work in dies, was, in the early stages, let in Philadelphia, Chicago and shops in Indiana and Ohio as an aftermath of the strike in Detroit almost two years ago. The present shortage in skilled mechanics is being relieved by using learners along with skilled men on various operations. Even in independent shops most workers are shaper men, boring mill operators, Keller operators, etc., and as a consequence, less time is required to become skilled.

Sales of tool shop equipment are reported improving, especially in the Ohio and Indiana areas. In the face of an extended period of steady work at increasing wage rates, labor troubles are not anticipated. It is reported that in some quarters a smaller proportion of tool and die work is now being done in corporation shops than formerly, due to the flexibility of the

independent shop and the resourcefulness of its workers.

A decided pick up in sales of standard equipment with the past month is evident and buyers are not asking for long time credit. This is due to better cash position, uncertainty as to what may be done to corporate surpluses and to the extension of bank loans to regular customers of the banks for equipment purchasers.

Chrysler Buys Plant

The Wills-Ste. Clair auto plant, built in 1918 by C. Harold Wills, was acquired by Chrysler last week. According to R. P. Foley, secretary of the Chrysler Corporation, the company has no immediate plan for utilizing its new facilities but is now employing every inch of space available in its plants.

Delco-Remy, General Motors division, also expanded last week through the purchase of the former LaFrance Republic Truck Co. plant at Bloomfield, N. J. Production will start in November on Delco batteries. In addition the company's plant at Muncie, Ind., will be enlarged.

Idle since last December, the American Austin plant at Butler, Pa., will get back into production. Roy S. Evans, young Atlanta dealer, who heads a group that recently acquired the property, announced a plan to buy $250,000 worth of new machinery.

Anticipated over a year, the small Lincoln to compete with La Salle and Packard 120, is expected to make its appearance on November 2 at a special showing of the Ford line in a New York hotel.

Heavy odds are indicated against labor trouble among automotive productive labor this Fall. Again steady employment at good wages and a receptive attitude on the part of management is responsible. However, in the early part of the month a joint meeting was held between the Associated Automobile Workers, the Automotive Industrial Workers and the Mechanics Educational Society looking to uniting for a Fall campaign. It is reported that the Hudson local union has petitioned for reentry into the A. F. of L.

Extending air conditioning beyond inspection and gaging rooms, the Ford Motor Co. announces an installation in its cylinder lapping department and mold rooms of the foundry. Variations in the size of blocks in the lapping room from variations in temperature will be reduced and worker comfort increased. Freedom from high cost Canadian nickel is to result from increasing use of molybdenum alloys,

Foreign Trade Aids Recovery In British Machine Industry

MANCHESTER, ENGLAND—According to a report by American Vice-Consul Myles Standish to the Department of Commerce, the machinery industry of the United Kingdom is the leader on the road to economic recovery. Plants are expanding, employment has increased and extensive orders and inquiries from both domestic and foreign sources are being received.

While production was 4 per cent higher during the first six months of 1935 than for the corresponding period of 1934, this slight percentage does not fully indicate increased production in certain fields of the industry. Production of machine tools was the most active in the domestic market during the period under review. Makers of electrical machinery were active, but a smaller share of their business went to the home market. Oil-engine makers, on the other hand, did most trade with companies in the United Kingdom producing heavy road vehicles such as municipal buses and motor trucks. Textile machinery manufacturers, after an extended period of depression, found their position improved with much of the gain due to orders from abroad, especially from the British Empire.

During the latter part of the half year, the British government gave a decided stimulus to various machinery trades by appropriating the sum of £35,000,000 for the modernization of the Royal Air Force.

Generally speaking orders received from the Empire and foreign countries were responsible for the relative prosperity of the machinery industry, during the first six months of 1935. Contracts for £3,000,000 were awarded to the Metropolitan-Vickers Co. for the electrification of the Brazilian Central Railway; a £100,000 order was received from abroad for an electrically-driven steel mill; and a £200,000 contract

Industrial Review

• After the five-year high set by machine tool sales in July and with the Machine Tool Show at Cleveland only two weeks off a recession in August had been expected. In some parts of the country, this slacking materialized, but other sections came through with business equaling or bettering the July level. The answer lies in "must" orders from plants that need equipment now and of necessity have to avoid the jam of orders the show is expected to initiate.

• Deliveries on anything at all special cannot be made before 1936, and even standard items, such as tool and cutter grinders ordinarily shipped from stock, are being quoted for October. Manufacturers are diluting experienced forces with green hands to accelerate training, but a dearth of skilled men still retards them. In some sections, a shortage of molders is even more serious than the lack of machinists. This condition, now known to buyers, is acting as an added stimulus in the placing of orders.

• New England, for instance, found August the year's best month with prospects for a continuation of good business through the fall. The New York district has noticed a tendency to hold off, but even so, August kept pace with July. Philadelphia had a fair month.

• Some business in Pittsburgh, Cincinnati and Cleveland has been held up by the coming show. Manufacturers, however, are well booked ahead because of the active summer buying and look for a new influx of orders in the fall. December and January deliveries are currently quoted.

• Standard tooling for new models has been well taken care of in Detroit but a good volume of special equipment is still to come. August was a very good month in the motor city. Activity in Chicago continues at a high level with some dealers reporting record sales.

• St. Louis was disappointed with August sales but anticipates a stimulus from post-show orders. The Pacific Coast, on the other hand, found business definitely improved and is greatly encouraged by developments in the last two weeks.

from South Africa called for the construction of twenty electric locomotives. Soviet contracts were satisfactory for some sections of the industry and included orders for paper-making machinery, forging and rolling plant for the production of railway tires and wood-working and saw-mill equipment. The following indicates, in pounds sterling, the total exports of machinery from the United Kingdom for the last three half-yearly periods:

Six months ended	Exports
June 30, 1934	£15,336,912
December 21, 1934	17,473,550
June 30, 1935	18,901,384

The following are the principal divisions of the export trade for the first six months of 1935:

Electrical mahinery	£1,960,646
Machine tools	1,118,454
Mining machinery	1,097,339
Oil engines	1,197,745
Textile machinery	3,540,066

During the same period the United Kingdom imported machinery to the value of £6,421,787. The largest single item in these imports was machine tools; others of importance were refrigerating machinery, office machinery and textile machinery. The United States was by far the most important source of machinery imports, with Germany and Canada following.

RFC Finances Budd Streamlined Train

Financial arrangements have been concluded between the Reconstruction Finance Corporation and the Budd Manufacturing Co., of Philadelphia, by which RFC agrees to finance 80 per cent of the cost of building an indefinite number of streamlined trains to be sold to the railroads on a rental basis somewhat similar to an equipment trust. There is an important distinction in that such purchases will not be added to railroad indebtedness.

The proposed loans would be industrial, not railroad, obligations, secured by mortgages on the trains and the credit of the manufacturer. RFC must approve plans for the train and also the agreement between Budd and the lessee before any loan will be made. The cost of such a train is set at approximately $250,000.

Although the present agreement applies only to Budd, the same plan will be available to other manufacturers. It will not apply to highly specialized equipment built for service under unusual conditions and not, probably to overnight runs, for which RFC believes the light-weight trains are ill adapted.

Government Orders Mainstay Of German Machinery Industry

BERLIN—A high rate of operation in the German machinery industry was maintained in July. The industry reports the re-employment of 30,000 workers since the beginning of the year.

This satisfactory domestic business was more than ever determined by large government spending. Private investment and modernization of machinery plants are checked by the fact that not only the profits but even the capital reserves of industrial corporations are being soaked by the Nazi Government's "voluntary" levies, such as Dr. Schacht's export subsidy fund. Besides, the numerous bans on the erection of new plants and the extension of existing ones considerably restrict modernization stimulus in these industries. The list of these bans is impressive and covers a wide variety of industrial products. It includes, among others, cement, steel tubes, electric cables, radio receivers, rubber tires, watches, cigar boxes, cigarettes and a wide range of chemical products.

The resulting loss of private business is, however, more than compensated by large scale government expenditure and investment. The importance of this factor may be gaged by figures just released by the German Statistical Bureau. They indicate that public investments, whether direct or indirect, made up no less than 67 per cent of the total in 1934 and that this percentage shows a tendency to rise further.

Smaller Machinery Exports

Machinery exports during the first six months of 1935 reflect the unsatisfactory foreign business of the German machinery industry. Monthly exports of industrial machinery averaged 33,600,000 marks in the first half of 1935 against 37,200,000 marks in the corresponding period of 1934. A closer analysis of these figures divulges the interesting fact that such branches of the machinery industry as have energetically continued the fight for foreign markets show considerable gain. At the same time branches that felt "saturated" by the flow of domestic orders resulting from the Government's employment and rearmament schemes were likely to neglect their foreign business.

There seems to be a significant relation between the gains and losses of foreign business and the ratio at which the respective branch of the industry operates. Thus the export business of the machine-tool industry shows a drop of 35 per cent compared with last year. This industry is now operating at more than 80 per cent capacity and need, therefore, not bother particularly about foreign orders. In contrast, the locomotive industry, whose capacity is only utilized to 38 per cent, has been able substantially to increase its export business.

"European Orientation"

An analysis of the direction of German foreign trade in machinery reveals a serious handicap to which this business is now subjected. In 1934, the distribution of German machinery exports by continents was as follows:

Country of Destination	Million Marks	Per Cent of Total	
European countries (without Russia)	302.3	69.8	
Russia	32.4	7.5	
Asia	43.5	10.0	22.7
South America	24.4	5.6	
Australia	2.4	0.6	
Africa	15.2	3.5	
North America	13.2	3.0	

Thus nearly 70 per cent of 1934 machinery exports went to European countries (without Russia) while only 23 per cent were taken by oversea countries. Yet the main efforts of the German Government are now directed towards restricting imports to indispensable raw materials which are mainly imported from oversea countries. This means that German machinery to a limited extent only presents a suitable object for barter trade with these countries while a constantly increasing part of German foreign trade is now flowing through the channels of public and private barter and compensation agreements.

Electrification of German Farms

Germany claims to possess the most highly electrified agriculture in the world. It bases this claim on figures of the 1933 economic census which are now being published. Over 1,000,000 farms, or 20 per cent of the total (including "dwarf" farms), operate one or more electric motors for various kinds of work.

This development is contrasted with that of the United States, where only 11 to 12 per cent of all farms are connected with electric power lines; in Germany the percentage of wired farms exceeded 80 per cent in 1933. This comparison does not, of course, take into account the greater use of gasoline motors in the United States.

A.S.M. Gives Program For Metal Congress

One of the features of the National metal Congress & Exposition to be held at Chicago, beginning September 30, is the varied program offered by the American Society for Metals. Thirty-nine papers will be presented, covering practically every branch of metal working.

Morning sessions will be held in the Palmer House ball room. Afternoon sessions will be held in the Exposition Hall. Over 300 authorities in the metal world have contributed time and experience to this program.

Outstanding among the papers and of special interest to the practical shop man are:

"Arc Welding of High Carbon and Alloy Steels," by T. M. Armstrong, Norfolk Navy Yard.

"Factors Influencing the Nature of the Cutting Speed-Tool Life Curve," by O. W. Boston, W. W. Gilbert and C. E. Kraus, University of Michigan.

"Endurance of Case Hardened Gears," by O. W. McMullan, International Nickel Co.

"Hardening Characteristics of One Per Cent Carbon Tool Steels," by T. G. Digges and Louis Jordon, U. S. Bureau of Standards.

Philadelphia Distributors Charter Special Train

Philadelphia machinery distributors have arranged to attend the Machine Tool Show at Cleveland in the "Philadelphia Machinery Special," a special air-conditioned club train. Leaving North Philadelphia on the evening of September 16, the train will arrive in Cleveland the following morning where it will be conveniently parked and available as a hotel with dining car and telephone communication.

Technical Sessions at Machine Tool Congress

In conjunction with the Machine Tool Show to be held at Cleveland, September 11-21, there will be a series of technical sessions as follows:

Wednesday, September 11, and Thursday, September 12—Technical discussions under direction of the Machine Shop Practice Division, A.S.M.E., Hotel Statler. George F. Nordenholt, *division secretary*.

Friday, September 13 — Dinner. A.S.T.E., Hotel Statler. Robert M. Lippard, *president*.

Tuesday, September 17—Dinner to foreign visitors, N.M.T.B.A. F. H. Chapin, *chairman*.

Wednesday, September 18, and Thursday, September 19—Technical discussions under the direction of the Production Activity, S.A.E. Hotel Statler. Vincent P. Rumely, *vice-pres.*

Friday, September 20 — Executive meeting and election of officers. Machine Tool Congress. Hotel Statler. C. R. Burt, *president*.

C. I. T. to Finance Machine Tool Purchases

Commercial Investment Trust has reserved space at the Machine Tool Show. This step is taken to indicate a greater interest on the part of this concern in the financing of machine tool purchases.

A financing contract has been recently closed by this company with a leading builder of machine tools. Other manufacturers have been given similar service.

OBITUARIES

CHARLES R. COBLENTZ, founder of the Coblentz Supply Co., Erie, Pa., formerly the Coblentz Tool & Supply Co., died August 19.

THOMAS A. EDISON JR., son of the late famous inventor, Thomas A. Edison, died August 25. Mr. Edison was stricken with a heart attack. He was 59 years old.

D. L. JONES, plant manager for the American Can Co., Chicago, died August 12. Mr. Jones was 58.

JESSE L. OBERDORFER, formerly treasurer of the M. L. Oberdorfer Brass Co., Syracuse, N. Y., died August 19. Mr. Oberdorfer, considered a leader in the brass castings industry, was 60 years old.

WALTER S. RUSSEL, founder of the Russell Wheel & Foundry Co., died August 17. At the time of his death he was a director of the American Radiator Co., Detroit Steel Products Co., Hoskins Mfg. Co., CeCord Radiator & Mfg. Co., and Detroit Lubricating Co., as well as vice-president of the Detroit Engineering society.

Fred Godfrey, Kent, well known manufacturer of machine tools and other machinery, died last week at his home in East Aurora, N. Y., at the age of 65. Born and educated in Grand Rapids, Mich., he entered the employ of George N. Pierce Co., manufacturers of bicycles and bird cages, at the age of 14. During his 21 years of service there, he rose from the position of machine shop apprentice to warehouse manager.

FRED G. KENT

He became associated with the St. Louis Car Co. in 1914 and later with the Lodge & Shipley Machine Tool Co., of Cincinnati. During the war he was a dollar-a-year man, acting as consultant on factory production. In 1925 he became vice-president of R. Hoe & Co., builders of printing presses.

Mr. Kent had wide fame as an industrial consultant. His specialty was the diagnosis and correction of manufacturing faults.

PERSONALS

J. H. BROWN, formerly eastern sales manager of Sullvan Machinery Co. has joined Worthington Pump & Machinery Corp. as regional manager of its mining and construction division, covering the Midwestern territory with headquarters in Chicago.

FRED H. COLVIN, Editor *American Machinist*, has been awarded a permanent membership by The American Society of Mechanical Engineers. Mr. Colvin has been a member of the A.S.M.E. for 40 years.

RENSSELEAR CLARK, former lieutenant commander in the United States Navy, who has been factory manager of the Bliss Engine Co., New York, has been appointed assistant general manager of the Sikorsky Aircraft Corporation, Stratford, Conn. Mundy I. Peale, director of advertising and publicity of the same concern, has been appointed to the newly created post of managing inspector of plant. Mr. Peale was manager of the western branch of the company from 1929 to 1933 when he joined the Hamilton Propellor Co., Hartford, another United Aircraft subsidiary.

Becomes Consultant

R. E. W. HARRISON

R. E. W. Harrison Leaves Department of Commerce

Effective September 15, R. E. W. Harrison, chief, machinery division, U. S. Department of Commerce, resigned to return to consulting practice. He will be associated with Eugene C. Clarke, with offices located at 1818 Packard Building, Philadelphia, Pa.

Mr. Harrison will act as technical consultant for such concerns as the Chambersburg Engineering Co., manufacturers of metal-working and forging equipment, and the Cochrane Corporation in the development of its line of steam specialties. His new activities will cover the entire range of management, including design, manufacturing and merchandising.

Mr. Harrison is a widely recognized authority on the machinery and metal-working industry. He has been with the Bureau of Foreign and Domestic Commerce since April, 1934.

BUSINESS ITEMS

American Electric Furnace Co. has appointed Carman Adams, Inc., 2970 West Grand Boulevard, Detroit, Mich., as direct factory representative for the sale and service of all their products in Michigan.

Foote Gear Works has appointed S. HOWARD EISENBERG as sales engineer and representative for Colorado, Utah, Wyoming and western Nebraska.

General Mfg. Co., Detroit, Mich., has appointed JOHN M. DAVIE, 224 South Michigan Ave., Chicago, Ill., as exclusive representative for the sale of general flexible power presses and shaft straightening attachments in that territory which includes northern Indiana, Illinois, Wisconsin and Iowa.

The Ingersoll Milling Machine Co., Rockford, Ill., has appointed The J. H. Ryder Machinery Co., Toronto, as sales distributors of Ingersoll cutters for Ontario and The T. E. Ryder Machinery Co., Montreal, as distributors for Quebec and eastern Canadian territory.

Revere Copper & Brass, Inc., Taunton-New Bedford division, will move from Taunton to New Bedford, Mass. Mill operations, however, will continue in Taunton. R. G. SCOTT remains as vice-president of this division.

PATENTS

August 13, 1935

Metal-Working Machinery

Apparatus for Reforming Can Bodies. James A. Gray, San Francisco, Cal., assigned to American Can Co. Patent 2,010,816.

Galvanizing Apparatus. Albert Bradley, Sterling, Ill., assigned to Northwestern Barb Wire Co. Patents 2,010,939-40-41.

Precision Grinding Machine. Arthur Scrivener, Birmingham, England. Patent 2,010,965.

Machine for Cutting Helical Gears. William E. Sykes, Buffalo, N. Y. Patent 2,010,970.

Machine Tool. Irving O. Miner, Seekonk, Mass., and Arthur F. Bennett, West Barrington, R. I., assigned to Brown & Sharpe Manufacturing Co. Patent 2,011,068.

Forging Machine. Merle W. Lamprecht, Rocky River, Ohio, assigned to the Acme Machinery Co. Patent 2,011,106.

Die-Casting Machine. Walter P. Sherman, Jackson Heights, N. Y. Patent 2,011,378.

Tools and Attachments

Double Purpose Threading Die. Chester F. Bruce and Rollin S. Bascom, Greenfield, Mass., assigned to Greenfield Tap & Die Corp. Patent 2,010,913.

Boring Chuck. John A. Ferguson, West Millcreek Township, Erie County, Pa. Patent 2,010,982.

Tool for Producing a change of Form in Sheet Metal. Hugo Junkers, Dessau, Germany, assigned to Junkers-Flugzeugwerk A. G., Dessau, Germany. Patent 2,010,996.

Cam Feed Drilling Head. Edward Joslin Kingsbury, Keene, N. H., assigned to Kingsbury, Machine Tool Corp. Patent 2,010,999.

Universal Type Machine Tool Unit with Differential Feed. Edward Joslin Kingsbury, Keene, N. H. Patent 2,011,000.

Universal Dressing Attachment for Grinding Machines. Arthur L. Wilder, Wethersfield, Conn., assigned to Pratt & Whitney Co. Patent 2,011,099.

Safety Guard for Abrasive Wheels. Max E. Lehmann, Park Ridge, Ill., assigned to the American Laundry Machinery Co. Patent 2,011,108.

Revolving Center for Machine Tools. Harold Fish, Stratford, Conn. Patent 2,011,273.

Arc Welding Apparatus. William F. Friedman, Youngstown, Ohio, assigned to David Clayman and Eugene Ungar. Patent 2,011,335.

Turret Mechanism for Machine Tools. Edward Joslin Kingsbury, Keene, N. Y. Patent 2,011,486.

Automatically Operated Turret and Tool Unit Structure. Edward Joslin Kingsbury and Gunnar Swahnberg, Keene, N. H., assigned to Kingsbury Machine Tool Corp. Patent 2,011,487.

Mechanical Movement for Turret and Like Devices. Gunnar Swahnberg, Keene, N. H., assigned to Kingsbury Machine Tool Co. Patent 2,011,488.

Processes

Magnetic Means and Method for Testing Welded Joints. Arthur S. Dysart, United States Navy. Patent 2,010,813.

Method and Apparatus for Electric Flash Welding. Warren F. Heineman, Shorewood, Wis., assigned to A. O. Smith Corp. Patents 2,010,592-3-4.

Method of Making Welded Irregular Shaped Hollow Articles. Donald W. Sherman, Sherwood, and Arnold G. Schilberg, Milwaukee, Wis., assigned to A. O. Smith Corp. Patent 2,011,121.

MEETINGS

AMERICAN GEAR MANUFACTURERS ASSOCIATION. Eighteenth semi-annual meeting, Oct. 14-15. The General Brock Hotel, Niagara Falls, Canada. J. C. MCQUISTON, secretary, Penn-Lincoln Hotel, Wilkensburg, Pa.

AMERICAN SOCIETY FOR METALS. Seventeenth annual meeting, Sept. 30-Oct. 4. Palmer House, Chicago, Ill. W. H. EISENMAN, secretary, 7016 Euclid Ave., Chicago.

AMERICAN WELDING SOCIETY. Fall meeting, Sept. 30-Oct. 4. Chicago, Ill. M. M. KELLY, secretary, 33 West 39th St., New York, N. Y.

ASSOCIATED MACHINE TOOL DEALERS. Annual meeting, Sept. 9. Cleveland Hotel, Cleveland, Ohio. HARRY BARNEY, secretary, Koppers Bldg., Pittsburgh.

INTERNATIONAL ACETYLENE ASSOCIATION. Thirty-sixth annual convention, Nov. 12-15. Cleveland Hotel, Cleveland, Ohio. H. F. REINHARD, secretary, 30 East 42d St., New York, N. Y.

NATIONAL INDUSTRIAL ADVERTISING ASSOCIATION. Convention, Sept. 18-20. William Penn Hotel, Pittsburgh. W. J. RAMSEY, Industrial Advertising Council, Box 1198, Pittsburgh, Pa.

NATIONAL METAL EXPOSITION. Seventeenth annual congress, Sept. 30-Oct. 4. International Amphitheater, Chicago, Ill. W. H. EISENMAN, secretary, 7016 Euclid Ave., Cleveland.

MACHINE TOOL CONGRESS. Cleveland, Sept, 11-21. Under auspices of National Machine Tool Builders' Association. Participating societies: Machine Shop Practice Division, American Society of Mechanical Engineers; Production Activity Division, Society of Automotive Engineers; American Society of Tool Engineers. HERMAN H. LIND, general manager, 1220 Guarantee Title Bldg., Cleveland.

MACHINE TOOL SHOW. Sept. 11-21, Public Auditorium, Cleveland, Ohio. HERMAN H. LIND, general manager, 1220 Guarantee Title Bldg., Cleveland.

SILVER BAY CONFERENCE. Eighteenth annual conference on industrial relations, August 28-31. Silver Bay, Lake George, N. Y. E. C. WORMAN, executive secretary, 347 Madison Ave., New York, N. Y.

SPECIAL TOOL, DIE & MACHINE SHOP INSTITUTE. Annual meeting, Sept. 14-16. Hotel Statler, Cleveland, Ohio. GEORGE J. HUEBNER, secretary, Guarantee Title Bldg., Cleveland.

WIRE ASSOCIATION. Annual meeting, Sept. 30-Oct. 4. Chicago, Ill. RICHARD E. BROWN, secretary, 17 E. 42d St., New York, N. Y.

American Machinist — REFERENCE BOOK SHEET ©

Belt Drive Calculation

Finding the distance between centers when the pulley diameters and the belt length are known

B. SPECTOR

Endless V-belts are manufactured in definite lengths to suit standard pulley combinations and center distances, as listed in manufacturers' catalogs. In certain cases it may be necessary to use a standard belt and a non-standard set of pulleys in order to get a desired reduction. The problem is to find the distance between centers of the pulleys.

For a certain speed reduction the requirements were best fulfilled by making the pitch diameter of pulley $v = 9$ in., diameter of pulley V = 30 in., and the length of the V-belt $VB = 196.4$ in.

Referring to the diagram Fig. 1

$$C = \frac{(R - r)}{\sin B}$$

The length of the belt is

$$L = 2(R - r)\cot B + AR + ar$$

The values of A and a are expressed in radians. By substituting degrees the equation becomes,

$$L = 2(R - r)\cot B + (180 + 2B)\ 0.01745R + (180 - 2B)\ .01745r \quad (1)$$

Evaluating (1)

$$21 \cot B = 135 - 0.367B \quad (2)$$

Set $y_1 = 21 \cot B$
and $y_2 = 135 - 0.367B$

Plot the curves y_1 and y_2 in Fig. 2. The curve y_2 is a straight line because it follows the typical formula $y = a \pm bx$. Hence, find only two points. Let B = 1, then $y_2 = 134.6$, and B = 10, then $y_2 = 131.3$ Solving y_1 for various values of B gives the following:

$B = 6$	y_1	$= 200$
7		171
8		149
9		132
10		119

The intersection of the curves y_1 and y_2 occurs at a value for B of 9.0 deg. This value of B satisfies expression (2).

$$VB = \frac{15 - 4.5}{0.1547} = 68 \text{ in.}$$

By the above combination of v and V the proper operating speed was obtained, but it was necesary to break-in the machine at a greatly reduced speed. Therefore, the two temporary jackshafts s and S were added, utilizing whatever pulleys and belts were available. For the drive from the motor to the pulley s a belt 118.53 in. long and two pulleys of 6 and 18 in. diameters were used. By solving equation (1) for these conditions expression (2) is found to be

$$80.97 = 12 \cot B' + 0.2B'$$

Plot curves y_3 and y_4 in Fig. 2. The value of B' is found to be 8.7 deg. The center distance is

$$C' = \frac{9 - 3}{0.1512} = 39.8 \text{ in.}$$

For the second reduction the pulley diameters are $p'' = 8$ in. and $P'' = 16$ in. Belt length is 105.06 in. Evaluating equation (1) for these conditions expresseion (2) is found to be

$$8 \cot B'' = 67.3 - 0.11B''$$

By plotting curves y_5 and y_6 the value of B'' is found to be 6.9 deg.

Then the center distance is

$$C'' = \frac{8 - 4}{0.1201} = 33.3 \text{ in.}$$

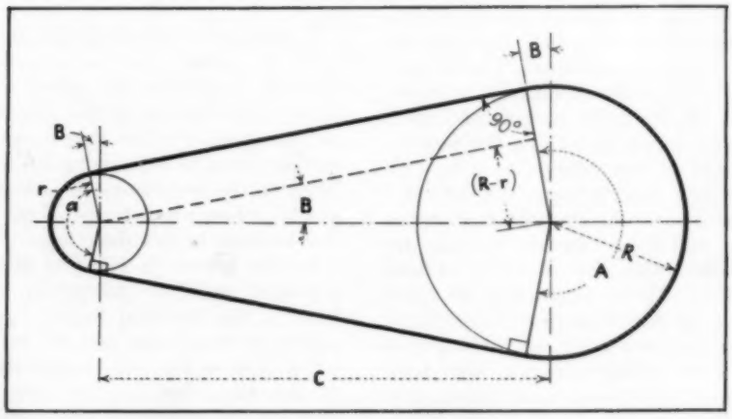


Fig. 1—The value of C *is to be found*

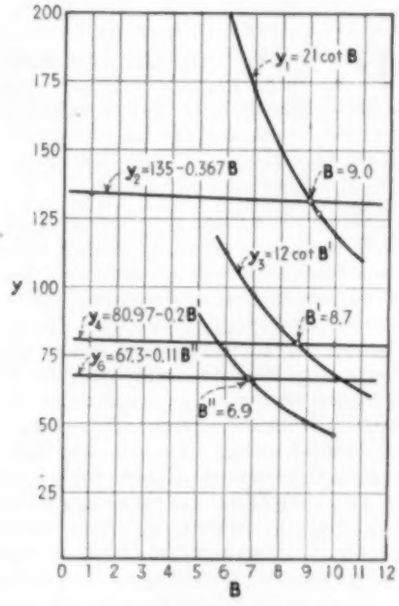


Fig. 2—Method of finding B

NEW BOOKS

ENGINEERING SHOP PRACTICE VOL. II. *By Orland W. Boston, Professor of Metal Processing, University of Michigan, 485 pages, 6x9 in. Published by John Wiley & Sons, New York. Price $5.*

This is the second volume of material prepared for higher grade engineering students at the University of Michigan. Intended primarily as a text book and arranged in that form with review questions at the end of each section, it naturally contains much of value to all who are interested in the development of machine tools and machine equipment for various kinds of metal manufacture. This volume has sections on turret lathes and hand screw machines, boring mills, automatics; broaching; gear cutting, shaving, grinding and lapping machines; grinding, polishing, buffing, honing and lapping; presses, punches and dies; die casting and molding; cutting fluids and measuring instruments and gages.

With such a wide range it is, of course, impossible to go into minute details of manufacturing methods. Rather the book gives a general outline of the fields covered by these machines and illustrates some of the operations performed. This outline gives a good general knowledge of the subjects and from the brief descriptions given, those interested will know what further lines of inquiry to pursue. The material has been carefully selected by the author with the knowledge of students requirements.

PRINCIPLES OF MECHANISM. *By C. E. Pearce, 283 pages, 6x9 in., 312 illustrations. Red cloth board covers. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York, N. Y. Price $3.50.*

Since it is written as an introductory text for college students having little first hand knowledge of machinery, the book is restricted to elementary mechanisms and simple machines. Mechanisms for transmission of power are separately described and analyzed in chapters on friction drives, gears, worm drives, belts and chains. Types of intermittent motion from cams and linkages are presented. Each chapter includes definitions and classifications of the type of mechanism in numbered sections. Fundamental relations are developed but an extensive list of problems is included at the end of each chapter.

AMERICAN MACHINISTS' HANDBOOK. *Sixth Edition. By Colvin & Stanley. 1,146 pages, 5x7 in. Published by the McGraw-Hill Book Co., 330 West 42 St., New York, N. Y. Price, $4.*

Although not a complete revision, the sixth edition of the American Machinists' Handbook has had careful attention in a number of important sections. Screw threads, which are always a vital subject where fine workmanship is concerned, have been carefully considered in the light of experience since the last edition. The tables are almost all new and are much more conveniently arranged for consultation.

Tap standards have also been thoroughly revised to conform with the latest findings of the Committees of the American Society of Mechanical Engineers and the American Standards Association.

The new standards for "self-holding" or *slow* tapers for drills, reamers and similar tools are included. These tables contain an entirely new series of drill shanks, the taper per foot being divided into three classes, according to the size of the tool being used.

The index has been completely rewritten and contains approximately double the number of cross references in the previous edition. This will make it much easier to locate all of the information contained in the 1,140-odd pages in the present edition.

ENGINEERING RADIOGRAPHY. *By V. E. Pullin, C.B.E., 136 pages, 8x11 in. Published by G. Bell & Sons, Ltd., London, England.*

The author of this outstanding volume is Director of Radiological Research at the Woolwich Arsenal. His work indicates that, as in our own country, the greatest amount of research along this line has been done by the Army rather than by industrial plants. There is no attempt to discuss the physics of x-rays as this information is already available. The volume is devoted to the reading, or interpretation of the x-ray photographs after they are made, this being the important part of the subject, as it is with medicine. Furthermore the interpretation is given in common engineering terms and the radiograph findings are compared with the actual conditions involved. These comparisons are made largely by comparative photographs of x-ray pictures and of photographs taken of etched sections. The halftones are printed on heavy plate paper that preserves all the details and makes the comparisons of great value.

Radiographs of various castings are shown, and include a variety of sections. Flaws in the castings and in welds are shown, and the effect of magnetism is included in the study as well. Gun tubes, box castings and other shapes receive careful attention. In fact all the information is given in such detail as to interest all who are engaged in work along this line.

BIBLIOGRAPHY ON THE CUTTING OF METALS, PART II. *By Orlan W. Boston, Professor of Metal Processing, University of Michigan, 202 pages, 5¼x8 in. Published by Edwards Bros., Inc., Ann Arbor, Mich. Price $2.50.*

Beginning with a reference to experiments on the efficiency of machine tools in Leipzig in 1873, this little volume gives 1,258 sources of information on the very important subject of cutting metals. References to American sources begin with the *American Machinist* in 1898 and continue up to the fall of 1934. Nearly every entry gives a brief outline of the phases of the subject covered by the article and a summary of the findings.

A subject index divides the references into such headings as Cutting Fluids, Machinability and Cutting Processes. The latter includes the various shop operations, making it easy to refer to the kind of information desired. There is also an alphabetical index of authors and other sources of information that will be found useful. All who are interested in securing information on metal cutting will find this volume of special value.

WHO PAYS? *By Ernest Greenwood, 301 pages, 5x7½ in. Illustrated. Cloth Binding. Published by Doubleday, Doran & Co. Price $2.00.*

In stating the question and answering it, the author's purpose is to dramatize and popularize the safety movement. The volume is not essentially statistical, but the fact that it can present an array of astounding figures relating to the destruction of human life and limb forms indictment of our passive attitude in this direction.

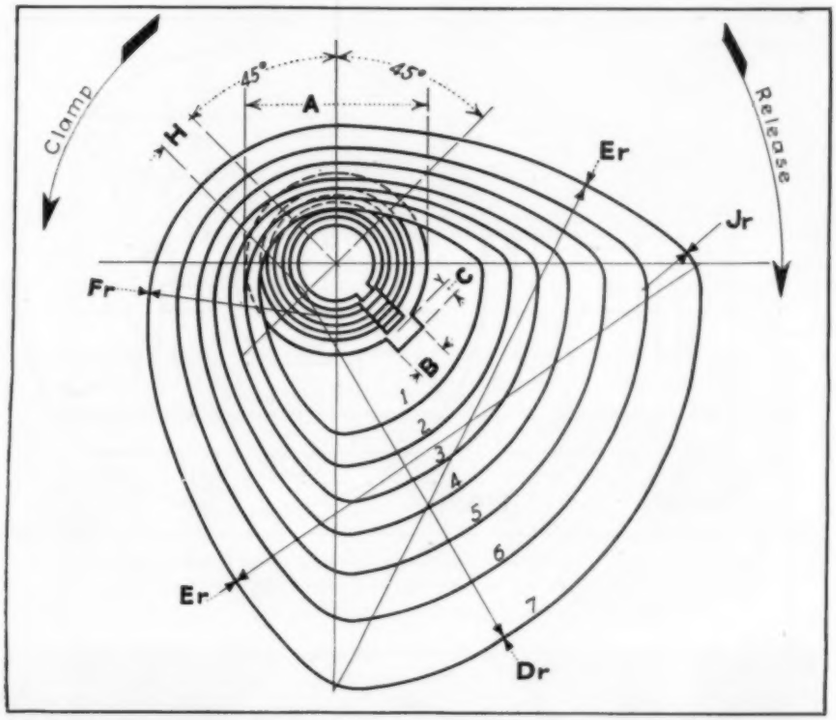
In the answer is found a plea for organized accident prevention. The work of the National Safety Council, insurance companies, schools and the police is reviewed with suggestions as to how this effort can be made more effective, by individual and collective action.

Ideas FROM PRACTICAL MEN

Cams for Clamping Work in Jigs and Fixtures

C. F. STAPLES

The cams illustrated in the accompanying chart are intended for use in jigs and fixtures, or in any other place where the combination of rapid approach and powerful clamping action is desired. The dimensions given in the table are scale dimensions and should not be used in an application requiring extreme accuracy. The cams are designed for ease of manufacture, and the surfaces developed by the radius *D* may be turned or ground by mounting the cams on a mandrel having centers offset the amount shown at *H*. While this will not produce uniformly accelerating cams, it will be found satisfactory for practically all fixture work.



No.	Lift 180°	Clamp 90°	Ratio 1" Lever	A	B	C	D	E	F	H	J	Width
1	13/16	7/16	8.4	5/8	1/8	1/16	1 1/16	1 33/64	41/64	3/64	1/8	1/2
2	1 1/8	7/32	7.2	3/4	1/16	3/32	1 1/16	2 13/64	3/4	3/32	1/16	3/4
3	1 5/16	1/4	6.2	7/8	1/16	3/32	1 13/16	2 5/16	7/8	3/16	1/4	3/4
4	1 1/2	9/32	5.6	1	1/16	3/32	2 1/16	2 33/64	1	7/32	1/16	1
5	1 11/16	11/32	4.5	1 1/8	1/16	3/32	2 3/16	3 21/64	1 5/64	1/4	1/8	1 1/4
6	2	3/8	4.2	1 1/4	1/16	3/32	2 3/4	3 41/64	1 1/16	9/32	1/16	1 1/2
7	2 3/8	11/32	3.3	1 1/2	1/4	1/8	3 1/4	4 13/32	1 5/16	11/32	1/2	1 1/2

Clamping devices for jigs and fixtures can be operated by these cams without danger of unlocking. In the table are given the necessary data for cams of different sizes

In the column headed "180 deg." is given the maximum amount of travel produced by the respective cams, and in the column headed "Clamp 90 deg." the maximum clamping range of each respective cam. It is advisable that this clamping range never be exceeded, and in cases subjected to excessive vibration the *H* dimension should be decreased approximately 3/32-in. As an extra precaution against unclamping, the operating lever may be weighted. It should reach the clamping position so as to tend to rotate the cam farther into the clamping direction. The operating lever should never be so positioned that its own weight tends to rotate the cam toward the reversing or unclamping position.

The amounts given in the column headed "Ratio 1-in." have been obtained by dividing the clamping travel into 1.5708, which is the distance travelled by a 1-in. lever rotated 90 deg., or one-fourth the circumference of a 2-in. diameter. Using Cam 1 as an example: One pound pressure on a 1-in. lever exerts a clamping effect of 8.4 lbs., or 1 lb. pressure on a 10-in. lever produces a clamping effect of 84 lbs. Thus the ratio given in the table is times length of lever, times pressure on the lever equals clamping pressure. Or inch-pounds times ratio equals clamping pressure. This is approximate only, since friction and other conditions have not been taken into account.

The dimension *E*, plus a small amount for clearance, is the width of space or opening in which the cam will operate. By providing means on a slide at the back of the cam, a positive return equal to the amount of the lift may be secured.

Centering and Drilling Very Small Holes

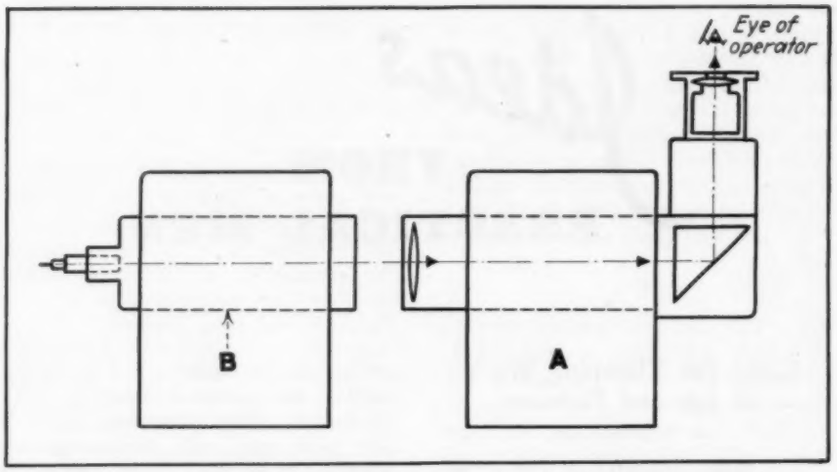
JOHN A. HONEGGER

At the laboratory of the Geophysics Survey Corporation, Dallas, Tex., many holes from 0.008 to 0.010 in. are located and drilled in the bearing plates of small clock movements. The locations of the holes are laid out by means of a vernier height gage, cross lines being scribed. To center the locations of the holes by any indicating means is impossible, yet they must be cen-

tered accurately and quickly, for which the following method is employed:

The tailstock of a precision bench lathe is removed and is replaced by a fixture holding a short-focus prismatic telescope, as at *A*, so that whatever is in range of the objective lens may be viewed at a right angle through the eyepiece. Care has been taken that the intersection of the cross hairs in the telescope coincides accurately with the center of the lathe spindle.

The operator clamps a bearing plate on the faceplate of the lathe, views it through the telescope, and then taps it until the intersection of the scribed lines on the plate coincides with the cross hairs, as seen through the telescope. Removing the telescope barrel from the fixture, he inserts in its place a duplicate barrel carrying a jeweler's drill, as at *B*, and proceeds to drill the hole.



The holes are centered optically by means of a short-focus prismatic telescope and are drilled by a drill, the mounting of which takes the place of the telescope barrel

Fixture for Boring and Facing a Double-Throw Eccentric

CHARLES C. TOMNEY
Chief Tool Designer,
Carrier Engineering Corporation

The details of a fixture for boring and facing one end of a double-throw eccentric are illustrated in Fig. 1, the fixture with the work in place being shown in Fig. 2. The fixture is attached to the face of the chuck of a turret lathe, the jaws having been removed.

Referring to Fig. 1, the body has a pilot at *A* to fit the central hole in the chuck, and a bushing at *B* for the pilot on the end of the boring bar, the bushing being cut away at *C* to permit the chips to fall out. Two V-blocks *D* and *F* are spaced to suit the work, and their seats are grooved to receive them.

Two pivoted clamps *H* and *I*, one for each end of the work, hold the piece in the fixture. The adjustable fulcrums *K* and *L* are used for adjusting the clamps to compensate for irregularities in different lots of castings. The weight *M* is for counterbalancing the fixture.

To avoid springing the work in clamping, the V-groove in block *F* is made slightly wider and deeper than the one at *D* and is used only for guiding the work sidewise. The inner end of the work rests on the end of the screw *N* and thus has a three-point bearing.

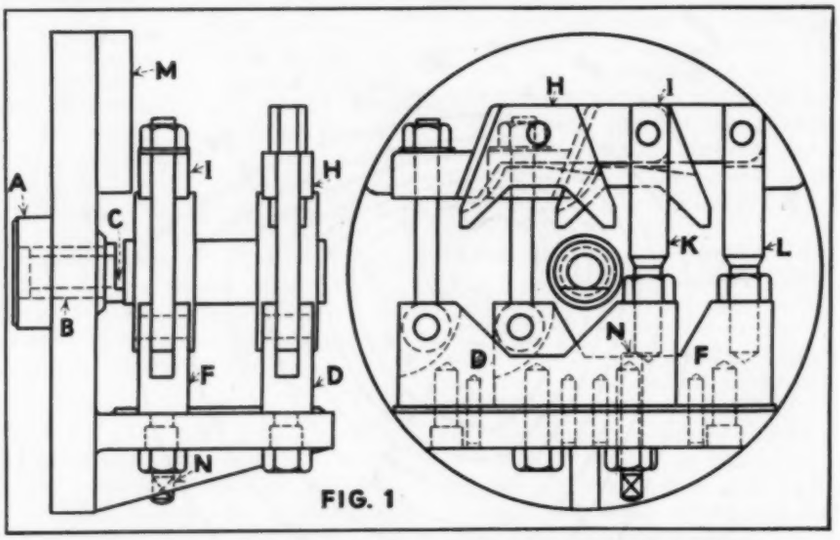


Fig. 1—The work is held in V-blocks by pivoted clamps and the fulcrums of the clamping levers are adjustable to compensate for irregularities in different lots of castings

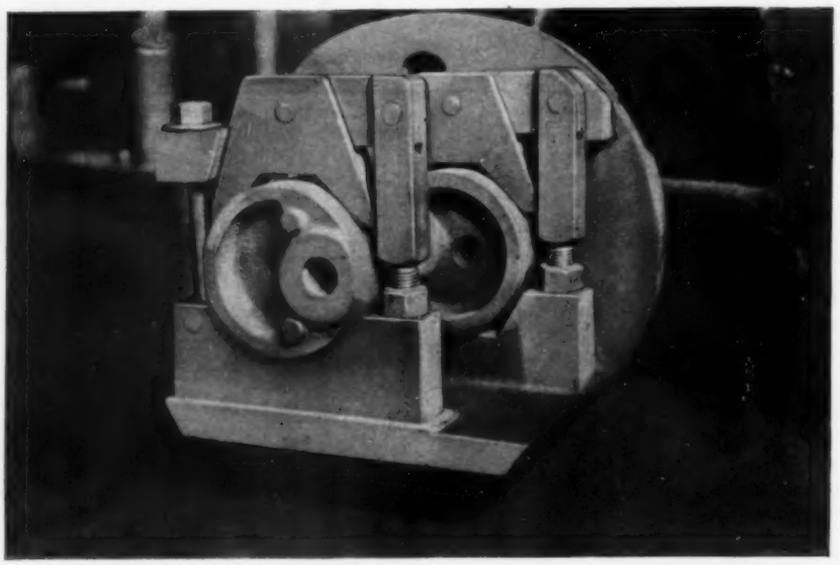
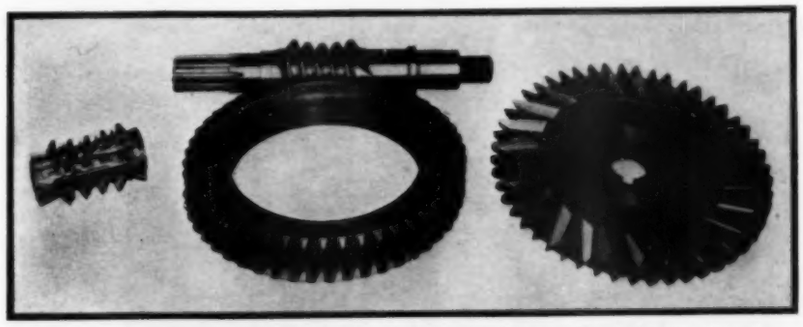


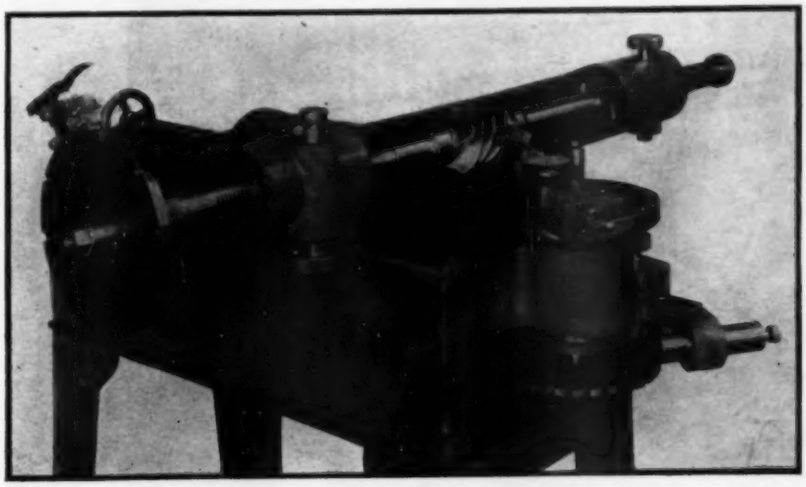
Fig. 2—The eccentric in place in the fixture. V-blocks, pivoted clamps, and adjustable fulcrums for the clamping levers can be seen

"Hourglass" Worms in Production

Automotive applications account for most of the Cone worm gears produced at the plant of the Michigan Tool Company



A Cone wormgear set and the hob and cutter used to produce the components



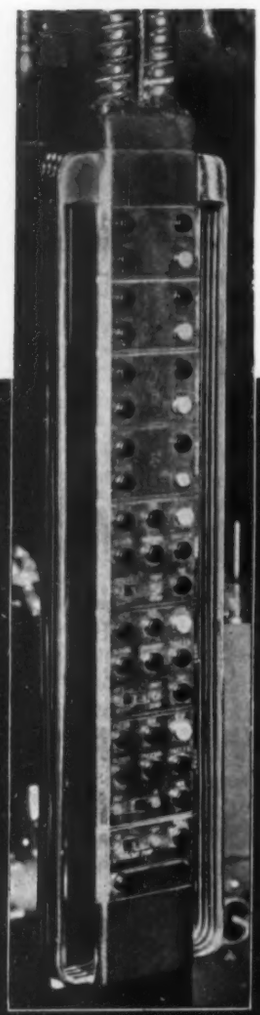
A special set-up is required to check the lead, pressure angle, and spacing of the threads

Since the development of Cone hourglass worm gearing (*AM*—Vol. 77, page 641) the Michigan Tool Company has gone into volume production, necessitating the building of special machinery and testing equipment. For large scale manufacture Gould & Eberhardt hobbing machines employ two hobs per workpiece, fed into the work from opposite directions. When the correct depth is reached one hob is rotated in one direction to cut the tooth form on the front of the tooth and the other is rotated in the opposite direction to form the flank on the back of the tooth. Production rates as high as 270 pieces per hour have been attained. For small production a special fly cutter is used.

Because of the large contact between the worm and wheel in Cone gearing, unit pressures are low and lubrication is easily maintained. The gears grow more quiet with use, but where exceptional quietness is specified at the start lapping on a special machine is done. In one automotive application a speed of 30,000 r.p.m. is encountered.

Shop Equipment NEWS

Ingersoll All-Electric Milling Machine

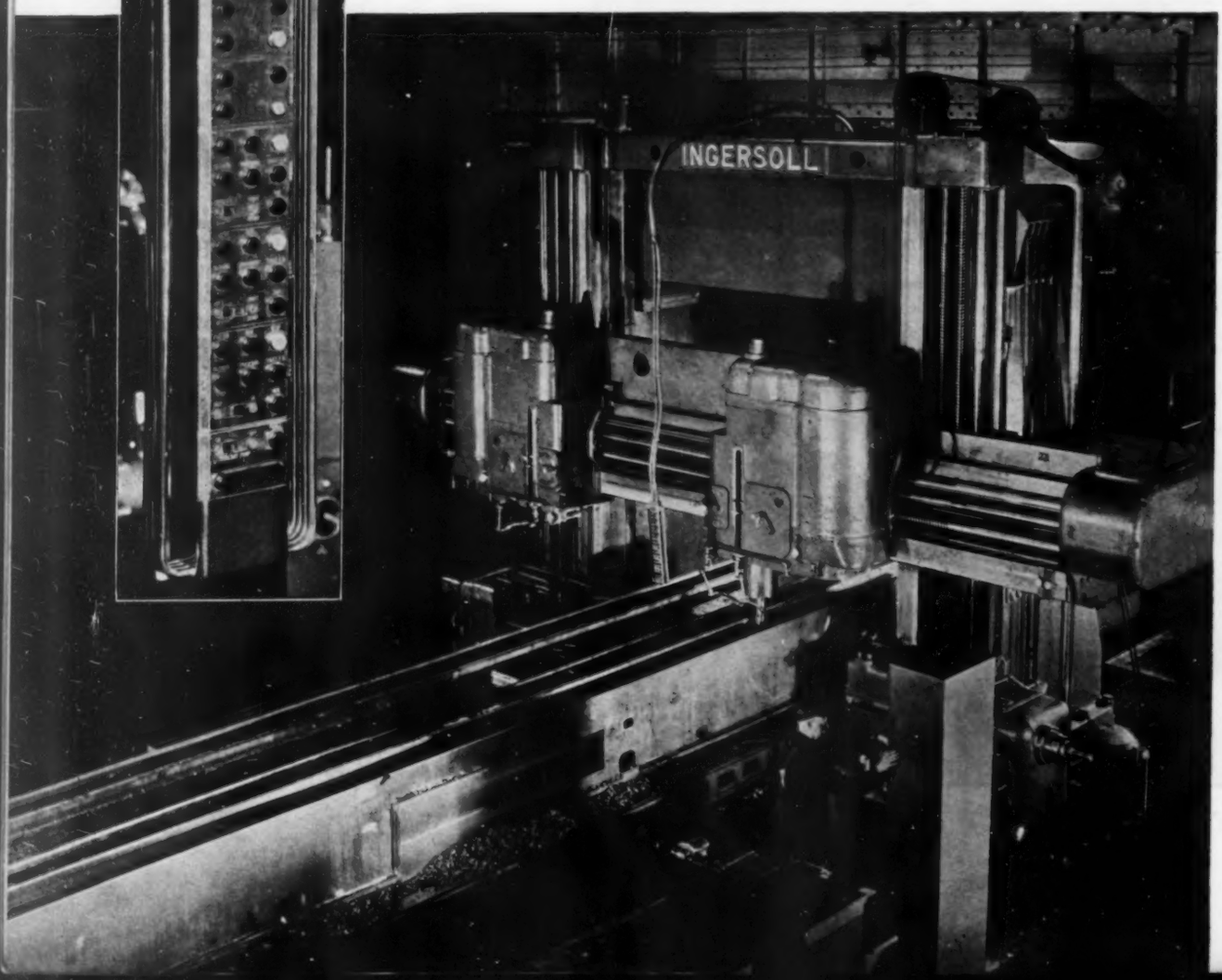


A planer type milling machine, 11½ ft. wide, 10 ft. high, and with a 40-ft. working surface, with completely electrical control, has just been installed for production work in its own shop by the Ingersoll Milling Machine Company, Rockford, Ill. In its construction both cast iron and welded structural steel units are incorporated, and the table drive is different from anything heretofore used in this type of machine. The outstanding feature of the machine, from the user's viewpoint, however, is the electrical control with its quite unique use of horsepower, speed and feed meters.

An electric push button control system connected to variable-speed d.c. motors relieves the operator of practically all physical effort and enables him to keep the machine working at close to its maximum limits as shown by the meters. Although the operator is relieved of physical effort he must be far more alert mentally than the operator of a conventional machine because the controls at his command are so much more sensitive, and because waste time and motion can be reduced to a minimum through proper use of various fast and slow motions.

While German machine tool builders have been using built-in meters for several years there was nothing at the Leipzig Fair this year that represented such a complete reliance on electrical control and driving units as is displayed in this machine.

In a measure this milling machine is experimental because no one has ever gone so far before in developing so elaborate a control system and one which eliminates all clutches except one. That one is used simply for transferring control from the rail to the right hand vertical head. A somewhat simpler machine embodying many of the same principles which has been in



service for several months has shown savings varying from 30 to 50 per cent, largely because of the facility of control.

While the machine as a whole is experimental in its conception there is nothing experimental about the various electrical devices employed. The contactors and relays are standard rolling mill control units designed for considerably more severe service than they are likely to encounter in this installation. There is nothing unusual about the meters except their method of graduation. Variable-speed d.c. motors have been used for years and the planetary drive through which their power is applied in the feed boxes has been entirely successful in the Ingersoll Power Pack.

The combination of welded structural steel parts with cast iron parts is unusual but the companies that did the welding are experienced and it is hard to tell without close examination which is the welded part and which the cast. As a matter of fact the columns, the heads and the table are cast iron while the bed, the rail and the bridge are welded steel.

In the feed boxes, the drive is through a planetary train either from the rapid traverse motor, or from the feed motor.

The drive to the table has a 30-in. helical gear on the shaft from the feed box driving a 30-in. worm through teeth cut in its perimeter. This "porcupine" worm engages a segmental rack on the bottom of the 40-ft. table. The arrangement eliminates long lead screws and shafts set off at angles, and minimizes the spring which previously prevented the attainment of a smooth action when starting such a high inertia load. It accounts for the ability to move the table by 0.002-in. increments by power.

The various motions of the machine can be controlled either from the panel on the cabinet or from the pendant. The push buttons on the two are duplicates. Incidentally, the pendant moves parallel to the face of the rail instead of in an arc.

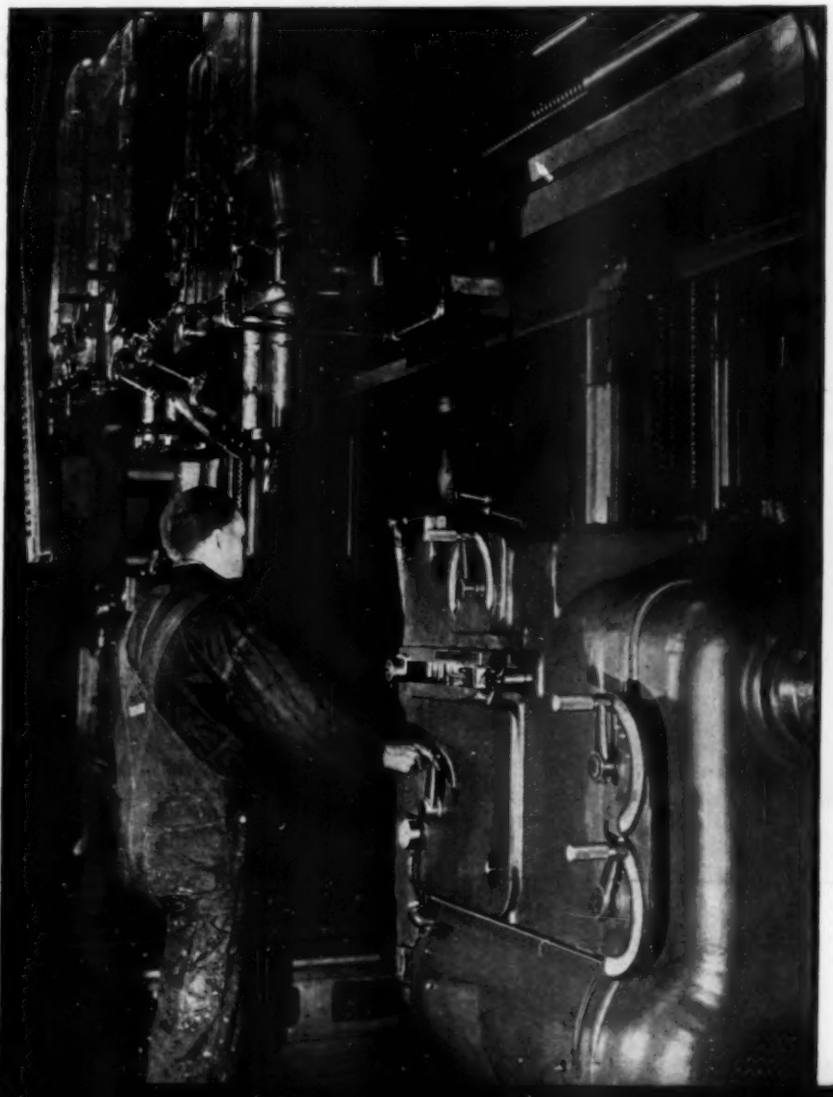
Each head is driven by a 2-to-1 variable-speed d.c. motor rated at 20 hp. continuous duty, 30 hp. for 1 hr., 40 hp. for 10 min. The motor driven rheostat that varies the field of current is controlled by the "faster" and "slower" push buttons. In operating the machine the operator will select a gear combination in the speed box that will give him approximately the correct estimated speed for his cutter. The spindle motor is started by pushing the start button. As the cutter enters the work at the table feed chosen the operator may decide that a higher speed is possible. To get it he pushes the "faster" button which causes the field rheostat motor to move the rheostat arm. The rheostat motor will function so long as the button is depressed. The motor r.p.m. can be read on the instrument dial on the cabinet panel. If the speed is still not high enough when the limit of field variation has been reached a new gear combination must be chosen.

Control panel showing signal lights at left, power and speed indicator dials in center, and push button controls of motions at right

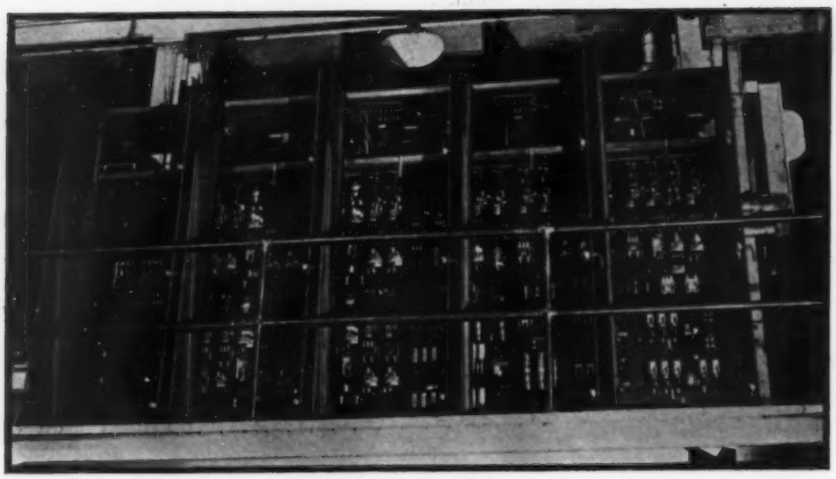
The operator may now decide that the feed can be increased. He does this through corresponding controls of the table but he must watch the horsepower consumption as registered on the panel instrument. If he reaches 40 hp. he knows that the overload breaker will throw off the power in order to protect the motor. If this protective device functions, all controls on the panel or the pendant must be reset.

Each of the four heads can be operated independently in the manner just described. An emergency stop button cuts off all power. The feed motors have a 4-to-1 speed ratio controllable as outlined above. In addition they can be jogged at intervals as small as 0.002 in.

While a right hand head is in the

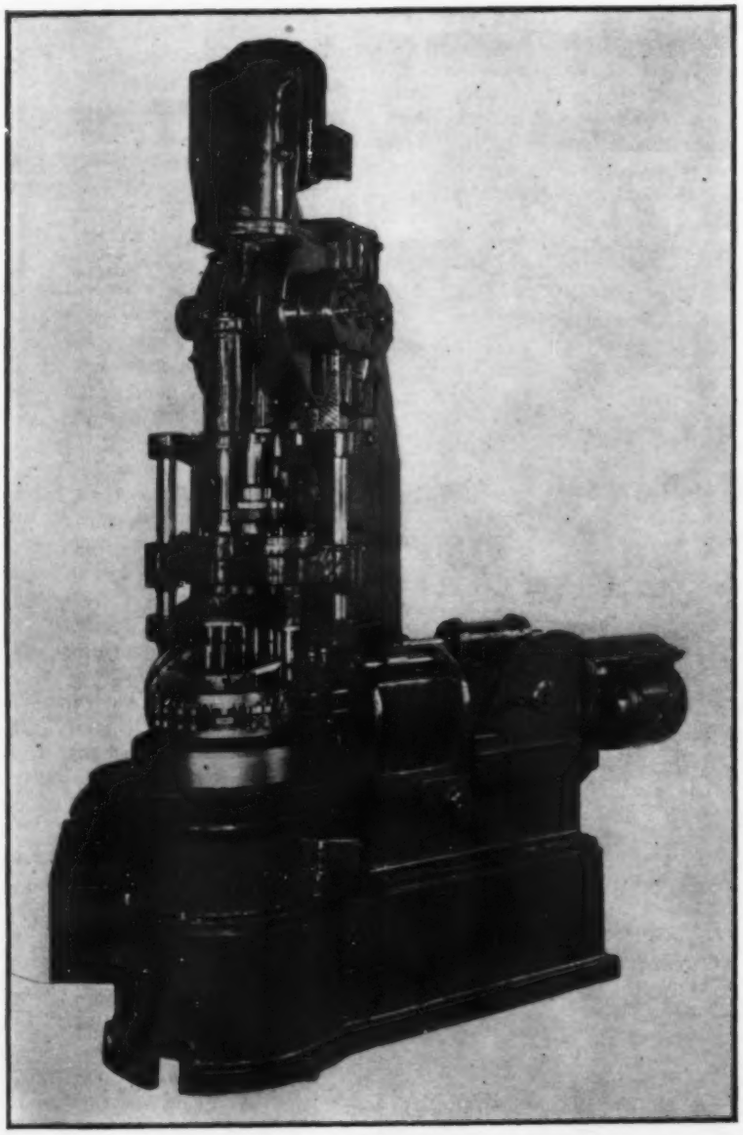


Close-up of operator at side head. Principal gear changes are made at this point, others at control station shown in upper illustration. Note the control pendant at the extreme left which duplicates the push buttons of the main control panel. This pendant moves parallel to cross rail



Rolling mill type electrical equipment on panels placed on a platform 8 ft. above floor

Millholland Indexing Drilling Machines



cut, a left hand head may be rapid traversed into position (or vice versa).

To jump between cuts, the operator merely presses the proper rapid traverse button, and when he releases it the feed drops back automatically to what it was previously set. Or if the jump is short, a button gives the top speed of the feed motor while it is pressed.

In general appearance the whole machine has been greatly improved by concealing all electric cables and coolant pipes and hose. By looking closely at the large illustration it is possible to see the sheaves at the top of the column over which the cables and hose run but they are not noticeable elsewhere.

A heavier No. 5 automatic indexing drilling machine with wider range of capacity and feeds and speeds has been developed by the Millholland Sales & Machine Co., 936 Georgia St., Indianapolis, Ind. The speed with which the index table will operate has been stepped up to 720 indexes per hour. The vertical drilling unit can include 4, 6, 8, 10, 12 or more spindles. Motors rated at 7½ and 3 hp., respectively, are employed on the vertical unit and on each of two horizontal units, which can be equipped with multiple-spindle drillheads. The machine is sensitive enough to drill ⅛-in. holes in steel and powerful enough to handle ⅞- to 1-in. drills in steel, 2½-in. boring cuts and facing up to 3-in.

The whole mechanism is synchronized by using a standard No. 5 Millholland automatic drilling unit in a vertical position as a master unit for all feeds, both vertical and horizontal and for automatic indexing. Motors on horizontal units drive tool spindles only. A feature of the machine is an underneath burring attachment for holes drilled through the work in a vertical position. An 18-in. diameter table is regularly employed in the machine and many compact designs of holding fixtures are available to permit multiple operation on a wide variety of parts.

Overall efficiency of the machine has been increased so that in most cases, in a complete cycle from one index to another, 70 per cent of the time is actually used in cutting metal; the remaining 30 per cent is employed in rapid approach and return of the tools and in indexing the table automatically. The table indexes continually, but there are always sufficient open stations to permit the operator to load and unload the machine easily.

An overload safety clutch is provided which prevents damage to the machine by tools breaking off or sticking in the work. An overload clutch throws out the feed to the entire feeding and indexing mechanism, and sets up a loud clicking sound when any interference to indexing or tool feeding is present.

Chip removal is accomplished by paddle wheels on the index table, which continuously push chips into a chute where they are carried by gravity into a strainer basket set in the coolant sump box. Separate motor-driven pump for coolant is provided. By substitution of multiple heads and fixtures and change of gears and cams, the machine can readily be changed over for different parts.

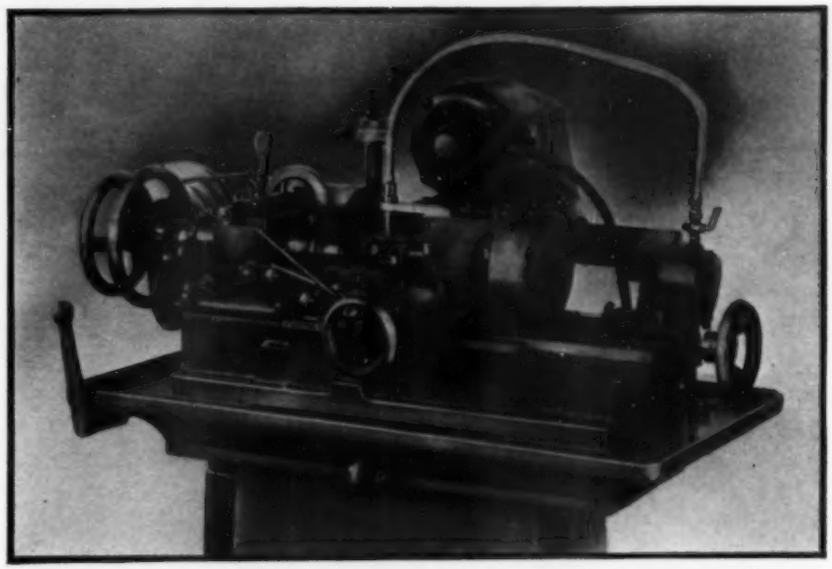
Equipment for Waltham Thread Milling Machine

The Waltham Machine Works, Waltham, Mass., announces special equipment for its thread milling machine to adapt it for manufacturing purposes. The standard machine for miscellaneous work has a single pulley drive and is operated either by a counter-shaft or individual motor. With special equipment, it uses two motors, eliminating the universal joint and connecting gearing by which the cutter spindle was driven from the constant-speed shaft.

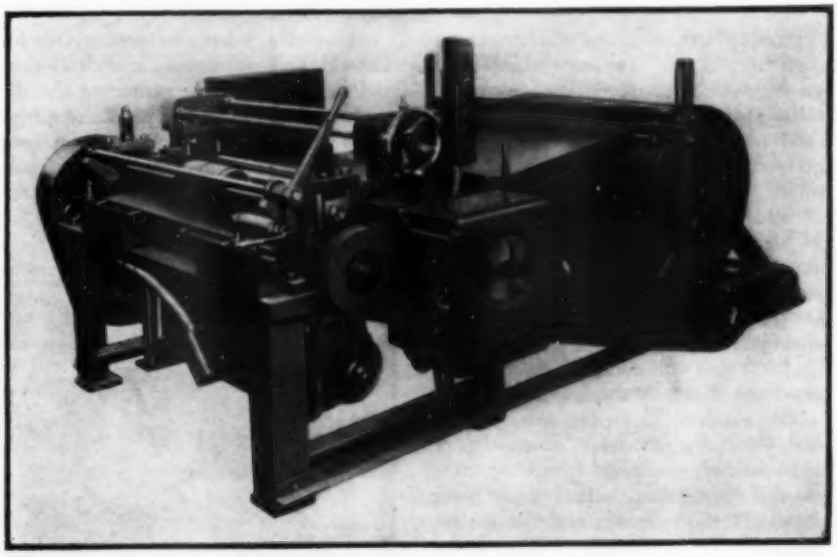
A motor is mounted on the cutter spindle head and is connected by either a V-belt or silent chain to the worm shaft that drives the cutter spindle. This arrangement in connection with a heavier cutter spindle increases the capacity of the machine so that a multiple cutter 1 in. wide can be used.

The leadscrew for the carriage has been removed and a camshaft substituted. This makes the machine more nearly automatic for multiple-cutter work, as the camshaft controls not only the pitch of the thread but feeds in and withdraws the cutter. It also returns the carriage to the starting position before the machine is stopped.

Although this equipment is for multiple-cutter work and no provision is made for swivelling the cutter head, another cutter head for use of a single cutter and swivelling the cutter head to the required helix angle can be used. A leadscrew can be used in the place of the camshaft where long threads are required. The machine is arranged so that the cutter, cam shaft and work spindle can be stopped simultaneously. Although it can be used as a bench machine, it is preferably used on a cabinet base.



Use of two motors eliminates universal joint and gearing to cutter spindle



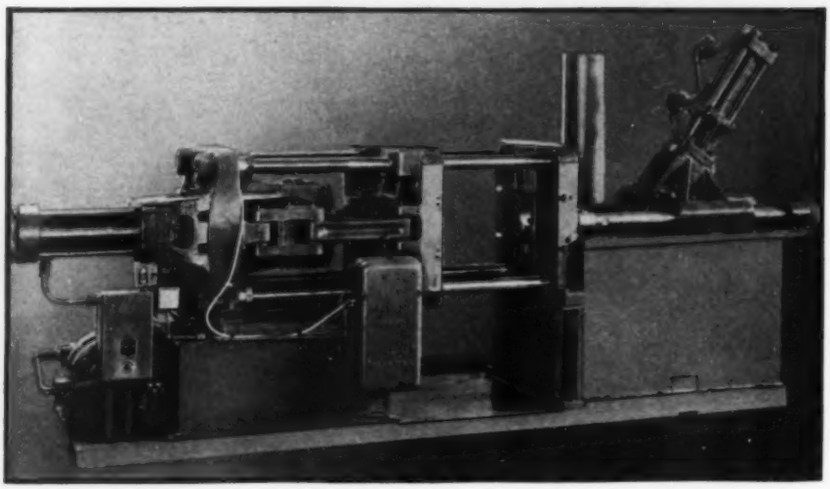
Littell Motor-Driven Feeding and Straightening Machine

Practically all large blanks have previously been cut from sheets cut to length, but by using coiled stock, a saving in the cost of blanks can be obtained. Two blanks are usually cut at a time, being staggered, so that there is no waste at the end of the sheet.

The F. J. Littell Machine Co., 4127 Ravenswood Ave., Chicago, Ill., has brought out a motor-driven feeding and straightening machine equipped with a reel for feeding wide stock. Any length of feed can be obtained and changes can be made in length of feed by means of a handwheel. This unit is portable and has the control panel mounted on the machine. A device is provided for measuring the various feeding lengths. When the press cuts a blank and the press slide starts up, the feeding machine automatically starts and feeds the stock forward the proper length through a five-roll power-driven stock straightener.

The machine is provided with a hand starting button, a stopping button, a button for inching forward, and a button for inching back, so that the stock is always under control.

Reed-Prentice Hydraulic Die-Casting Machines



Castings are produced efficiently and economically and machine maintenance on die-casting equipment has been materially reduced as the result of the rigid construction of the machine announced by the Reed-Prentice Corporation, Worcester, Mass. The machine is hydraulically operated throughout with one standard Vickers oil pump, and the control valves for the die cylinder as well as the plunger cylinder are standard Vickers products. The operating links are made of cast steel, bushed with hardened bearings and pins with facilities for lubrication.

The machine is arranged so that it can be operated either manually or automatically. Two levers control manual operation. The first lever closes the die cylinder, and the second controls the operation of the metal plunger cylinder. These levers are interlocked so that it is impossible to operate the plunger cylinder until the dies are securely closed.

For automatic operation it is only necessary for the operator to throw a third lever to the right, putting the machine automatically through the cycle. The first operation is closing of the die, and the second operation is the down movement of the metal plunger cylinder forcing the metal into the die. A third operation incorporates the electric time delay relay, allowing for dwell, or solidifying period, from 0 to 20-sec., eliminating the necessity of the operator estimating the solidifying period. At the end of the time the automatic timing circuit is set for, the machine automatically goes through the reverse cycle ready for the next operation.

When the dies are constructed for automatic ejection, they open and eject through holes in the center of the die plate. Die plates are planed on four sides allowing for application of core pulling attachments. The movable die plate is bronze bushed, with oiling facilities.

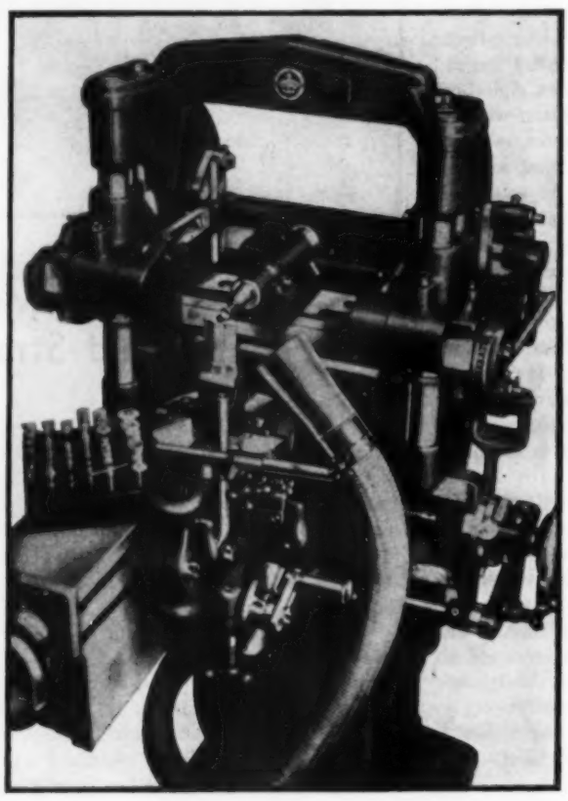
These machines are available in three sizes, having piston diameters as follows: 2½-, 3¾- and 4½-in. Pressures in these machines are 4,900 11,000 and 16,000 lb., respectively.

Grinding Attachment for Thiel Shaper

Punches when hardened usually become distorted, and their final finish involves considerable hand-work. A device, which allows the grinding of such hardened punches and which is used in connection with the Thiel vertical punch and form shaper, is announced by Marburg Brothers, Inc., 90 West St., New York, N. Y.

The attachment greatly enlarges the scope of the work which can be handled on this shaper. It consists of a self-contained unit operating at spindle speeds of up to 40,000 r.p.m. It takes the place of the tool or toolholder regularly used on this machine during shaping operations.

Only the tool has to be replaced by the grinding attachment to change from cutting to grinding. The swinging motion of the toolholder support, which in shaping operations takes care of the radius at the lower end of the punch, is disengaged by loosening a screw. Tool holder support, and with it the grinder, makes only a vertical reciprocating movement which can be adjusted for position and length of stroke the same as in shaping.

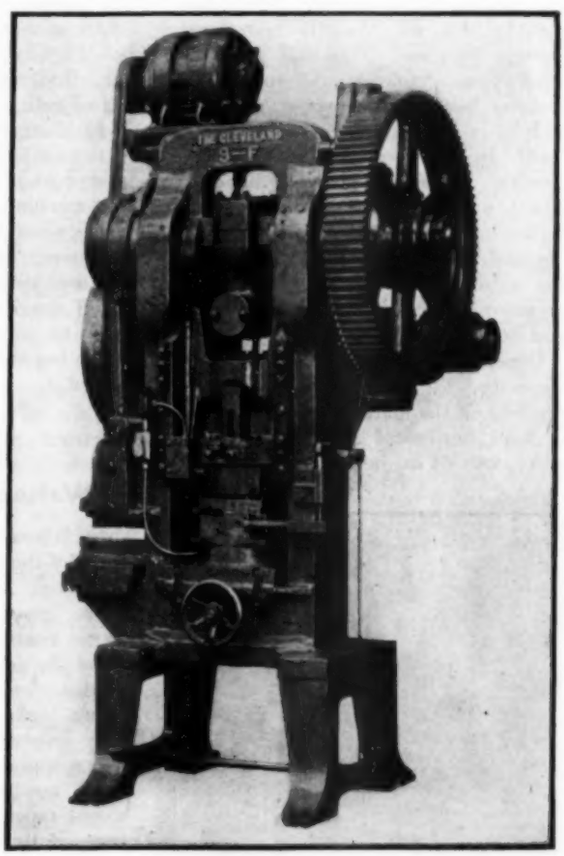


This attachment greatly enlarges the scope of work that can be handled on the Thiel shaper and allows the grinding of hardened punches

Cleveland Trimming Press

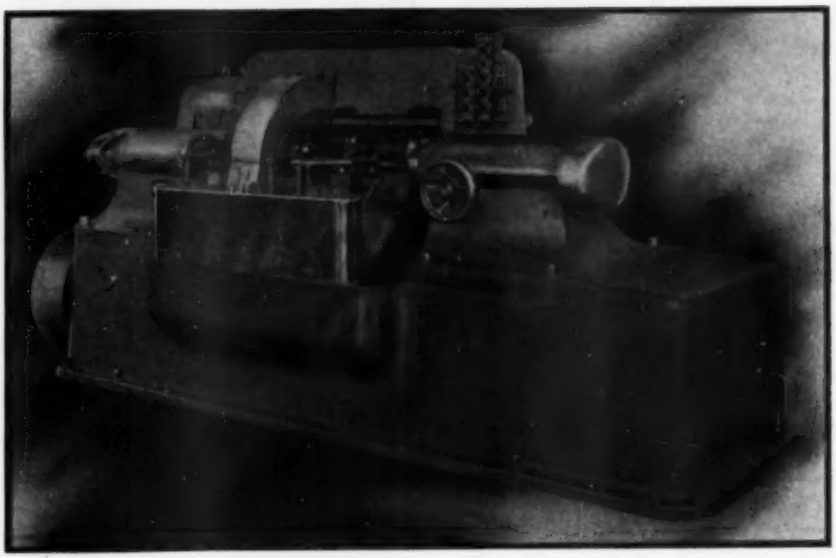
The Cleveland Punch & Shear Works Co., Cleveland, Ohio, has announced a line of trimming presses, known as 9F, designed for upsetting test pieces. The pieces are first cut to length on the side shear which has full-hole shear blades and adjustable back gages. After being cut, the pieces are then set on end under the inner slide and are securely held in an upright position by means of a magnet block. This block can readily be adjusted for various sizes of test pieces by use of a handwheel. This handwheel, which is conveniently located at the front of the press, adjusts the magnets back to the proper height, the adjusting mechanism being so designed that each notch on the dial of the magnet registers one thousandth of an inch. A positive lock is provided to hold the adjustment securely when it is once set.

Arrangement is made in the slide to take care of major adjustments. The entire attachment is boxed in and is equipped with a safety door so that the press cannot be operated until the door is closed. The clutch also has a non-repeat attachment, thus providing double safety for the operator.



Test pieces, after being cut to length, are held in an upright position under the inner slide by a magnet block

Wickes Center Drive Crankshaft Lathe



An automatic center-drive type crankshaft lathe, designated as Model C, has been designed by Wickes Brothers, Saginaw, Mich., for the cheeking, turning and filleting of all main line bearings, for turning and shouldering the stub end of the crank, for turning and straddle-facing the flange and turning the oil groove on 4, 6 and 8-throw crankshafts having 3, 4 or 5 main line bearings. The crankshaft is mounted on centers and is driven by means of a chuck, which securely clamps the crank arm adjacent to the center main bearing. This chuck, which is mounted in the center drive gear, not only drives but also holds the crankshaft in alignment during the machining operation. The front tools are mounted on the front cross-slides in the conventional manner, while the rear tools are mounted on inverted cross-slides carried in the back tool housing.

An electric push button starts the machine, and the work cycle is entirely automatic, providing the following sequence of operations: Rapid traverse of the tools to the cutting position, coarse facing feed, fine turning feed, diameter stop, dwell, which permits the crankshaft to revolve six or eight revolutions while the cutting tools are held at the finish diameter in order to clean up the cut, stop of the lathe in the unloading position and rapid traverse of tools to the unloading position. Jogging buttons are provided so that the main drive gear or the tools may be jogged to any position desired for setting up the machine.

The center drive gear is of steel with herringbone teeth and is mounted on two large tapered roller bearings. Spindles are 7 in. in diameter with live centers. Automatic forced feed lubrication is provided throughout the entire machine. Main drive is by means of a 25-hp. motor through multiple V-belt. Weight, including electrical equipment, is 21,000 lb.

Smooth Surface Metallic Screens

By a system of controlled ionic migration, smooth-surface, fine-mesh metallic screens are being produced for various industrial purposes by the Electrolytic Products Corp., 250 West 39th St., New York, N. Y. These screens can be made in any desired mesh, and screens as fine as 400 holes per linear inch have been built. Electrolytic deposition, in the nature of a single piece of metal, forms screens which are flat and smooth.

A 120-mesh woven-wire cloth ordinarily would have an opening of approximately 0.0045 in., yet by this method a 120-mesh screen can be supplied with a hole in excess of 0.006 in. or with a hole of any smaller size, even down to 0.001 in.

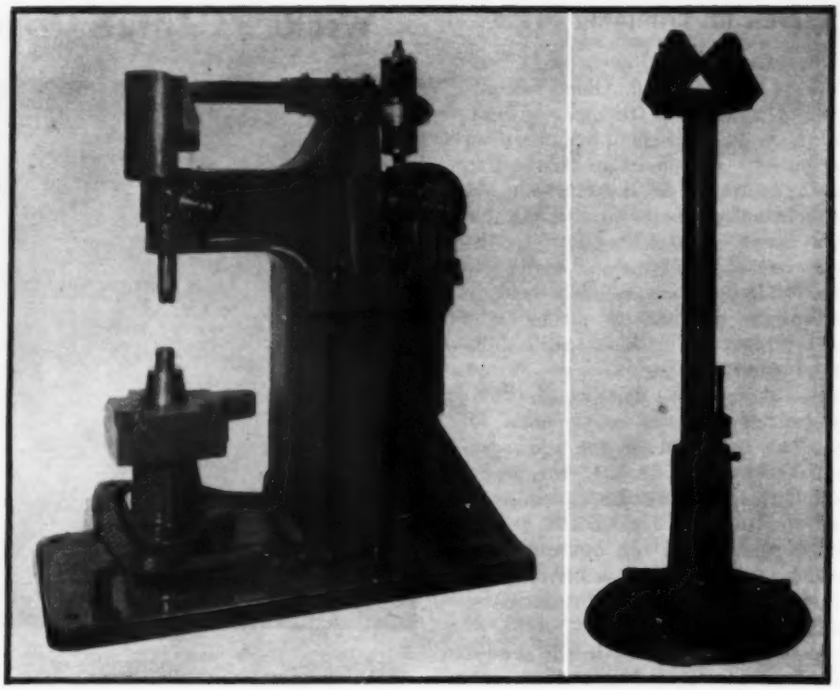
These screens possess desirable acoustic properties and have been found suitable for use on certain high-grade telephone transmitters and broadcast transmitters, as well as for pick-up devices used to aid the deaf. Having no cross wires with wedging effects to catch the solid substances and because of ease of cleaning, these screens are of advantage in applications involving sifting and straining, whether dry or liquid.

Smooth surface screens are usually manufactured with a circular hole, but the shape of the hole can be controlled. Sheets of this screen are available up to 20x24 in., but larger sizes can be made.

Mercil Centrifugal Dryer

Available in two dryer shell sizes, 12x12-in. and 18x18-in., the Mercil type centrifugal dryer, introduced by Hanson-VanWinkle-Manning Co., Mattawan, N. J., is particularly well adapted for use in conjunction with plating barrels, as the small floor space required, 17x33 in., allows it to be set close to the barrel. Transfer of the work is a simple operation and pieces to be dried may be placed directly in the perforated shell or in a separate basket which fits the shell.

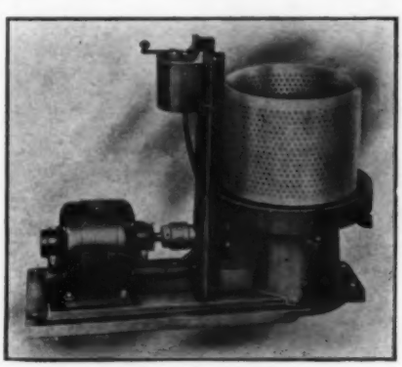
Power for driving the turntable at 600 r.p.m. is obtained from a ½-hp. motor through a pair of bevel gears. Four roller bearings support the driveshaft and turntable. Lubrication is provided by running the gears in a bath of oil, which also circulates to the bearings. A conveniently located reversing switch allows the operator to control the direction of rotation. It is not necessary to bring the basket to a stop before operating the reversing control.



High-Speed No. 7B Riveting Hammer

To meet the demands of an increasing field in heavy cold riveting, the High-Speed Hammer Co., Inc., 305-321 Norton St., Rochester, N. Y., has brought out its No. 7B high-speed riveting hammer. This unit will cold head 1½-in. diameter mild steel rivets, forming oval heads, in 30 sec. each, and ¾-in. diameter rivets in 7 sec. each. In the case of riveting flanges, greater diameters can be handled. These hammers are also capable of performing many operations of swaging and forming, and will also permit the substitution of rivets and studs in assemblies where previously screws and bolts were used.

General specifications are as follows: Capacity, ¾- to 1½-in. diameter, depending on the material, size and shape of head, horizontal gap, 15½ in., floor space, 28 x 64 in., height, 74 in.

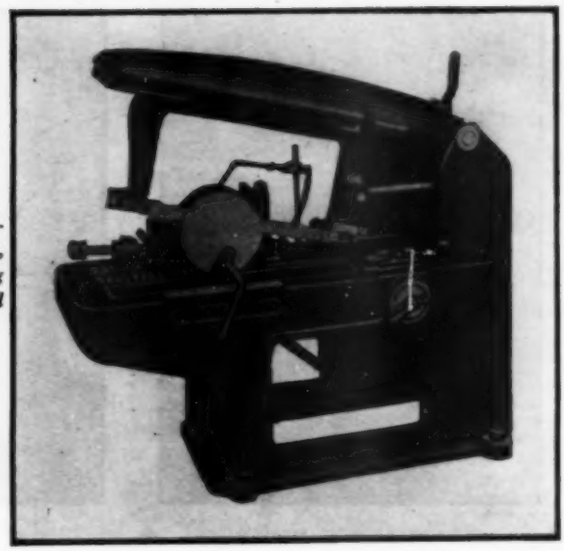


Campbell Bar Type Floor Stands

Campbell bar type floor stands, for use with its Models 202 and 203 wet abrasive cutoff machines and Model 20 dry abrasive cutoff machine, were recently announced by Andrew C. Campbell Division of American Chain Co., Inc., Bridgeport, Conn. They have a self-adjusting feature which saves time in handling stock. Any shape or size of stock which the machine will handle is supported at the correct height for the machine without further adjustment when the stand is once set to the proper height. Although designed for use with the Campbell abrasive cutoff machines, the stands can be used to advantage in many places where bar stock or tubing must be supported.

Watson-Standard Plicote

In laboratory tests, Plicote, developed by the Watson-Standard Co., 225 Galveston Ave., Pittsburgh, Pa., has shown great resistance to chemicals. Tanks coated with Plicote have withstood the action of 50 per cent caustic solutions at elevated temperatures. Brine tanks have also been successfully coated. Painting of concrete floors, a problem because of the strong alkali reaction of the concrete which would saponify any film, may now be successfully accomplished.



Operation of the Orion hacksaw is entirely automatic, and it requires no "helping along" during the start and finish of a cycle

"Orion" Hacksaws

High and constant production, uniformly straight cutting and long life of the individual saw blade, are claimed as principal features of the hydraulically controlled power hacksaw, "Orion," marketed by Marburg Brothers, Inc., 90 West St., New York, N. Y.

The entire sawing operation is an automatic cycle and requires no supervision during the start and finish of a cycle. After the saw is started, the bow is automatically lowered and the sawing takes place at first with a minimum of pressure. After a groove has been cut, the pressure builds up rapidly to a few hundred pounds, during the larger part of the stroke. At the beginning and end of each stroke the pressure is reduced to zero. Towards the end of the sawing cycle, the pressure decreases to almost zero and the saw is automatically stopped when the cut is completed. The bow is automatically returned to the starting position.

Pressure desired is set at the start by means of a lever. Chatter and vibration, causes of frequent breakage of saw blades, are eliminated, because the bow is rigidly guided by two large gibs on either side.

Kote-Rax Covering

Kote-Rax, a non-contaminating, corrosion-resisting coating for plating racks, has been announced by the Hanson-Van-Winkle-Munning Co., Mattawan, N. J. Applied by dipping, Kote-Rax covers the rack with a tough, rubber-like film possessing high dielectric resistance and capable of withstanding considerable mechanical abuse. Extensive tests indicate that it is not affected by immersion in the common solutions used in plating baths. Racks protected by this coating have been used as long as two months without showing signs of deterioration.

Kote-Rax must be heated for use in non-metallic tanks. The average application consists of four dips at 230 to 260 deg. F.

Thor Portable Drill

The smallest, lightest-weight portable electric drill ever built, weighing only 2½ lb., has been introduced by the Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill. This tool, the U-14, in the ¼-in. capacity, and the U-13, in the $\frac{3}{8}$-in. capacity, will drill through steel ¼ in. thick in 5 sec. It fits easily in one hand, a feature that makes it a tool that serves equally well in production and plant maintenance.

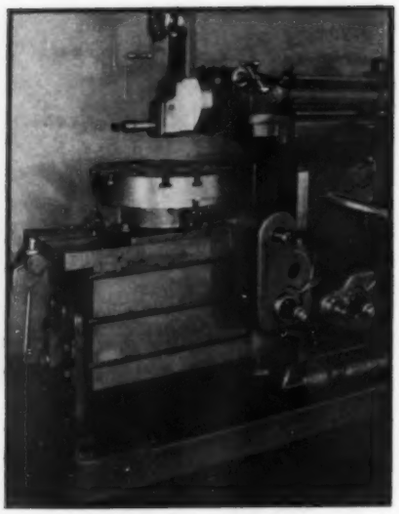
Ball-bearings and accurately machined, heat-treated helical gears reduce noise and vibration to a minimum. These features also reduce heat generated. It is equipped with a Jacobs chuck and carries as regular equipment one set of extra brushes which are inclosed in a special compartment in the housing of the tool.

Pratt & Whitney Die-Sinking Cutters

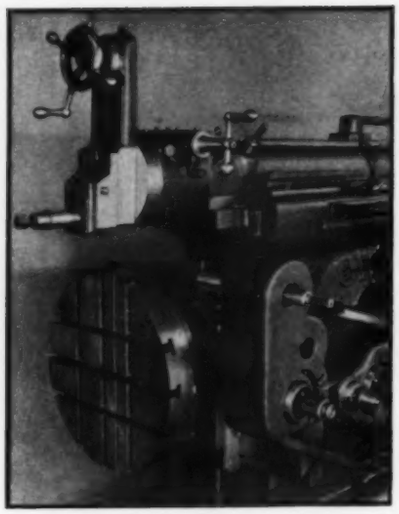
Three die-sinking cutters for high-speed use have been introduced by the Pratt & Whitney Co., Hartford, Conn. They are known as ball-end, square-end and 7-deg. taper cutters. The design of the helix angle and relief is such that the cutters can be operated at spindle speeds up to 3,600 r.p.m. in tough die steels.

The ball- and square-end cutters are regularly furnished with right-hand cut and right-hand spiral flutes. Both of these types of cutters are available in thirteen sizes, ranging from ⅛ to 1¼ in. in diameter. Shank diameters are the same as the diameter of the cut except for the two smaller sizes which have ¼-in. shank. Length of cut varies from ⅞ to 3¼ in. on the ball-end type and from ⅞ to 2¾ in. on the square-end cutters. The overall length of both types ranges from 2¼ to 5½ in.

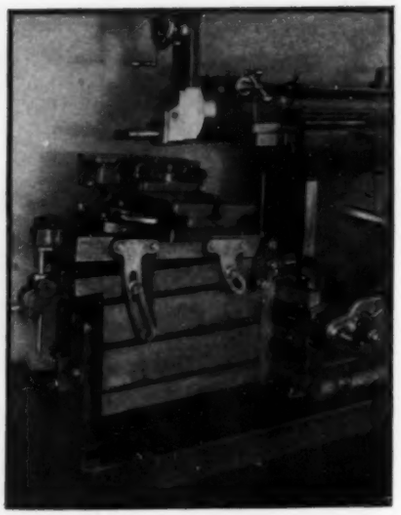
The 7-deg. taper cutters are available in twelve sizes ranging from ⅛ to ½ in. This nominal size designates the diameter of the ball at the small end. The 7-deg. taper is on one side, the included angle being 14 deg. These cutters, also are regularly furnished with right-hand cut and right-hand spiral flutes. Diameters of shanks on these cutters range from ½ to 1 in.; the length of cut ranges from 1½ to 3 in., and the overall length from 3½ to 5½ in. This type of cutter may be used for both roughing and finishing operations. It is also supplied as a roughing cutter with nicked or gashed teeth. This cutter can be furnished with a taper of 10 deg. on a side, with other specifications unchanged. The design and size arrangement of these cutters are new, resulting in adequate chip clearance for severe service on widely varying conditions and providing sufficient projection length necessary in deep die-sinking.



Concave attachment



Convex attachment



Tilting top on table

Ohio Heavy Duty Shaper

The Ohio Machine Tool Co., Kenton, Ohio, has shipped to the machine shop of Boulder Dam a 36-in. heavy-duty shaper, equipped with attachments designed for special machining operations.

One of the set-ups embodies a circular power feed to the head, commonly known as a concave attachment, and a circular table, complete with hand and power feed, mounted on the regular table of the machine. This circular table is connected with the regular fed mechanism. Feed changes are made separately from the feed to the cross travel of the table. The device also has a circular hand feed, and the outside diameter of the table is graduated in degrees.

What is known as a convex attachment is formed by mounting this same table and feed mechanism on the apron. To do this it is necessary to remove the regular table.

The adoption of a tilting top for the regular table requires no dismantling of the machine. It is mounted on the regular table. It has a minimum inclination of 20 deg. Dials are installed for easy reading.

Carpenter Free Machining SAE Alloy Steels

The utility of selenium as a free-machining element has been established during the past few years through its extensive use in 18-8 chrome nickel stainless steel. It is announced by the Carpenter Steel Co., Reading, Pa., that this same selenium gives promise of successful use in practically all other types of iron and steel products.

It is claimed that selenium is superior to sulphur as a free machining element in two important particulars. First, a given percentage of selenium does not produce as much slag-like material as an equal percentage of sulphur. Second, selenium is more potent in its free-machining effects than sulphur, so that a smaller percentage of selenium is required in order to produce the same free-machining effect. These two advantages combine to produce a steel which is very much cleaner and more uniform than would be a higher sulphur steel having the same machining properties.

The presence of selenium does not interfere with the response of the material to heat-treatment and it is anticipated that many applications will be found where free-machining SAE alloy steels can be satisfactorily applied.

Offsetting the natural advantages that selenium has over sulphur as a free machining agent, there appear to be two disadvantages. Selenium is more expensive than sulphur so that its use will be reflected in the higher price of the product. All work done thus far has been on electric furnace melted steel which is rather conducive to higher quality than lower costs. Therefore, it is likely that the applications of these new free machining alloy steels will be somewhat selective and may be limited to the manufacture of parts in which the machining costs are relatively high compared to the weight of the steel involved.

The experimental work described in the patents covering this metal is extremely comprehensive, covering practically all S.A.E. types of analyses, both in the low carbon carburizing grades and in the higher carbon tempering grades.

Randall & Stickney Model C-10 Indicator

Model C-10 indicator, developed by Frank E. Randall, 248 Ash St., Waltham, Mass., is a small, long-range indicator which reads in ten-thousandths of an inch. The company's original method of making these indicators in two units, the case unit, consisting of case, rack, rack spring, guide pin and guide block, and the plate unit, consisting of plate, wheels, pinions, cocks, center bridge, dial and hands, has been carried out in this model. This construction is convenient when repairs are needed, as the plate unit can be removed from the case unit without disturbing any part of it or removing the rack spindle.

The back is held in position by four large screws, so that the bracket can be reversed or held at right angles to the spindle. It has a range of 0.3 in.

The Round Table

A NEW LINE

"Say, Al, I think I've found a chance to add to our business and likewise to our income."

"That sounds good, Ed. We can always use more business. It makes us expand and hire more overhead, whether we want to or not. What's the idea?"

"A new sort of motor, Al, especially designed for farm use. The design is simple, easy to make and would fit right in with our machine equipment. I've asked the inventor to come and see you."

"Fine, Ed. I'll be glad to look it over, of course."

"You don't sound enthusiastic, Al; I thought you'd jump at it. You haven't even seen it yet, and you look as though you don't like the idea. What's wrong with it?"

"I can't tell you yet, Ed. It may be all right. But we're looking at it from different angles."

"What angles? Can't you make motors as well as compressors?"

"Of course, Ed. We can make motors, or washing machines, if they fit into our plant. But how about selling and financing, Ed. Has this inventor money enough to pay us for building these motors and any way of selling them?"

"I don't believe he has, Al, but he wants only a small royalty. He doesn't expect a fortune."

"That's what I thought, Ed. You ought to know that making a thing is only a small part of the story. If we could just make compressors and have customers lined up at the shipping platform to cart them away, life would be just a bed of roses."

"But why can't you sell motors as easily as you do pumps? They could be built for a song."

"I'm not good at singing, Ed, and you're no Caruso. I'll bet that they can't be built much, if any, cheaper than farm engines now on the market. They are mostly a hole with cast iron around it, and they're turned out like corn out of corn shellers. When it comes to selling—it gives me a pain to think of it."

"Why should that be so hard, Al? We have a good reputation, and good customers."

"But neither of them count outside of compressors. We'd have to build up a sales organization that knows farm machinery or else find a jobber to handle them."

"You sure can throw bucketsful of cold water on a new idea, Al."

"I don't mean to, Ed. But you don't live with the business as I do. Selling is the big item, not making. I'd like a new product, especially if it could sort of iron out our peaks in production demand. But when it comes to trying to sell farm engines with our set-up, I'm not for it."

Should Al take on the new line suggested by Ed? What sort of a product would best fill out his production schedule?

DISCUSSION

A Fair Price

While competitive bidding insures obtaining fairly satisfactory prices, there is need for checking the fairness of prices. This can be best accomplished by cost analyses and breaking down the supplier's costs into the basic elements of raw material, labor and overhead. Such analyses will either divulge weaknesses in the supplier's methods or will suggest changes that will result in better prices to the buyer without detriment to the supplier.

Obviously, information of this kind can be obtained only when there exists a mutually satisfactory relationship between buyer and seller. Something more than a consideration of price is necessary to develop such a relationship. It must be developed by strict adherence to a policy that, while prices must be fair to the buyer, they must also be fair to the seller, because he must prosper sufficiently to continue as a reliable source of supply. Recognition by the supplier of the buyer's willingness to consider their differences fairly, and a willingness on the supplier's part to give suggestions and assistance in making purchasing studies that will develop results to both parties, will be mutually beneficial.

Another means of determining when prices are fair is by comparing such analyses with competitive cost data on products manufactured in the buyers plant. —Ira S. Williams.

Share the Wealth

Ed is very unwise to listen to the plan of soak-the-rich advocates. Wealth is best distributed in the form of fair wages paid for efficient production. The wealth of rich men is largely invested in industry and the wages paid by these concerns give the public its buying power. If the rich were done away with, it would mean only transferring their belongings to a greater number of investors. The same amount of money would still be needed

to run industry, so the amount in circulation and available for purchasing goods would be approximately the same.

A more even distribution of wealth might make an improvement, provided it were made gradually and the wealth was distributed for work done, or as Al states, for efficient production.

In uncivilized countries there are no rich as we know them, yet in time of want their inhabitants suffer more severely from famine and poverty than do those of civilized countries. That proves that the rich are not responsible for depression and poverty. Soak-the-rich advocates have a very imperfect financial outlook due to their seeing from one point only.

—W. E. WARNER,
Bromley Common, Kent, England.

Training Men

Breaking in semi-skilled help in the average-size plant is generally intrusted to the foreman of the department involved. There are departments, however, where the machining operations are of such diversified nature as to render it difficult and unreasonable to expect the foreman to be highly skilled in each type of operation. It is sound practice in such cases to utilize a skilled machine operator for instructing green help. However, some men, when given the task of training green help, may become too independent and cocky and take too many privileges, thus neglecting their own duties too much.

The highly skilled man in any class of machine work has many knacks and knows many kinks that less skilled men do not have or know. If this type of workman possesses good philosophical traits and displays ability in getting along with men, it would be logical to place him as a gang leader in the class of work in which he is engaged. If the proper selection of new help is made, the gang leader's skill will be transferred to them in due time.

To train men for occupations requiring skill, a skilled and practical instructor must be employed to gain real results; there is no other way out.

—PETER L. BUDWITZ.

Five-Day Week

The question of whether the shop shall work five days a week instead of six days, the total time being 40 hours, is one that should be decided on its merits. If it is right that something be done, it should be done regardless of who is running things.

According to my way of thinking, there is nothing more disgusting than for an executive to inflict unnecessary hardships on men for no other reason than to show them who is running things. I never knew of such tactics being employed by other than weaklings who lacked the capacity to maintain their prestige by leading and enlightening their men.

If honest and sincere men are wrong, they are entitled to know where they are wrong, and it does not matter whether the question is that of working five days a week, locating a screw or joining a union. It sometimes requires time and thought to prepare an easily understood and satisfactory explanation as to why certain proposals emanating from the shop are rejected, but in most cases it would be time well spent.

There will be plenty of times, when men are wrong, for an executive to show his superiority by being able to set them on the proper course when the occasion arises.—RUPERT R. USREY.

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